Ceramics, Lithics, and Ornaments of

Chaco Canyon

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Chaco Canyon

Analyses of Artifacts from the Chaco Project 1971-1978

Volume II. Lithics

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Chapter Three

The Chipped Stone of Chaco Canyon, New Mexico

Catherine M. Cameron

Introduction

The sixteen sites excavated by the Chaco Project produced more than 34,000 pieces of chipped stone (Table 3.1). These sites were excavated between 1973 and 1979 and included small sites dating between A.D. 500 and 1300, as well as Chacoan greathouses (29SJ 389—Pueblo Alto and 29SJ 391—Una Vida). Chipped stone materials were analyzed between 1976 and 1980 and this report was prepared in 1982; minor editorial corrections were made to the report in 1995. Individual reports on the chipped stone for each site had been previously prepared (Cameron 1979, 1980 a-j) and in some cases, published (Cameron 1985, 1991, 1992, 1993).

The analysis of chipped stone presented here addresses three major topics: 1) raw material selection and acquisition, 2) production technology, and 3) tool function. One of the most important goals of the 1982 report was to provide descriptive data that could be readily integrated with data from other artifact categories—ceramic, faunal, architectural, etc.—into a standard spatial and temporal framework to facilitate production of a final synthetic report. In 1995, this synthesis has not yet taken place.

Table 3.1. Sites excavated by the Chaco Project and chipped stone frequency.

Site	No. of Pieces of Chipped Stone
29MC 184	43
29SJ 299	265
29SJ 389 (Pueblo Alto)	12,339
29SJ 391 (Una Vida)	103
29SJ 423	2,827
29SJ 626	266
29SJ 627	7,145
29SJ 628	1,055
29SJ 629 (Spadefoot Toad Site)	7,025
29SJ 630	188
29SJ 633	632
29SJ 721	126
29SJ 724	1,095
29SJ 1360	1,047
29SJ 1659 (Shabik'eshchee Village)	172
29SJ 1947 (Pueblo del Arroyo)[a]	47
Total	34,375

[a] Chipped stone from Pueblo del Arroyo included in this analysis was from collections made prior to the Chaco Project.

Research Goals

Research goals of the Chaco Project changed over the 10 years of its duration. One of the earliest stated goals was to examine the development through time of adaptation in the canyon (Corbett 1969). To achieve this goal, some sites were selected for excavation on the basis of apparently long occupations. The thrust of the last six years of the project, however, shifted toward an explanation of the role of Chaco Canyon as a central place (Judge 1977). Consequently, analyses emphasized movement of goods into and through Chaco Canyon. Changing goals, as well as significant changes in field techniques, produced a somewhat disparate database. The analysis of chipped stone emphasizes the more recent goals while also attempting to provide a

descriptive base for questions of intra-canyon development.

Judge's hypothesis (1977), that sites in Chaco Canyon were part of a redistributive network, provided a framework around which regional questions could be asked as follows:

1) What are the locations of the sources of chipped stone raw material exotic to the local Chaco area?
2) How were these materials acquired?
3) What does the distribution of exotic chipped stone at sites in Chaco Canyon tell us about the nature of the exchange system operating in the San Juan Basin?

A concurrent goal was the investigation of local subsistence behavior and adaptation—the following questions were addressed:

1) What was the nature of the local raw material acquisition?
2) What was the nature and location of various stone tool manufacturing processes?
3) What was the nature of tool use activities?
4) What was the nature of the discard process?
5) What do the nature and location of chipped stone activities tell us about past social organization and economic activity?

Analyses

The investigation of these questions consisted of a multi-stage analysis. First, all chipped stone artifacts were identified by material type, artifact type, and presence or absence of cortex. Grouped weight was recorded by artifact type and material type. Artifact types included angular debris, unutilized whole flake, utilized flake, retouched flake, core, projectile point (corner-notched, side-notched, other), tool (scraper, drill, other), and unmodified raw material (see Table 3.2). These categories were the basis for subsequent analyses. The second stage was a detailed analysis that recorded attributes of technology, function, and material type. This analysis was performed on a sample selected primarily from the utilized and retouched flakes. Further special analyses were performed on projectile points and tools (Lekson 1980; Chapter 4 of this volume) and on cores (Appendix 3C).

This multi-stage analysis evolved during the course of the project. Initially, it was hoped that each piece of chipped stone recovered from excavated sites could be subjected to a fairly detailed analysis. During the winter of 1976-1977, Cameron analyzed chipped stone from several sites with an initial version of the detailed attribute form. Only 1,100 flakes were processed in a ten-week period. Obviously, the total collection could not be handled in this way. During the summer of 1977, Marcia Truell, field laboratory director, instituted a chipped stone sorting procedure that could be integrated into the computerized inventory of other artifact types. This sorting procedure (the "preliminary sort") seemed a feasible alternative to analysis of all flakes using the detailed form, as it provided both overall description of the collection and data specific to material type and tool utilization. It was adopted, with minor revisions, as the initial stage of the chipped stone analysis program. During the next winter (1977-1978), Cameron applied this analysis to chipped stone from all sites excavated by the Chaco Project to date. It was continued during the next field season (1978-1979) on the remainder of the chipped stone from Pueblo Alto. The detailed analysis continued to be used for selected proveniences and on a sample of utilized and retouched flakes. The original detailed analysis form was revised twice during the five years of its use and was used by a total of three analysts. Tables 3.3 and 3.4 contain a summary of this information. The results of the detailed analysis will not be discussed further here. They were originally an appendix to this report but were dropped from the report in 1995 at the request of the author.

Changes in laboratory personnel and procedures were a source of variation, particularly at site 29SJ 389 (Pueblo Alto). During the 1977 field season, when excavation began at Pueblo Alto, analytical procedures (the preliminary sort) for chipped stone did not include the use of a microscope. The frequencies of artifact types for the 1977 season, when compared with the 1976 and 1978 seasons (when a microscope was used), show significantly lower frequencies of utilized and retouched flakes for the 1977 season ($\chi^2=593.94$, df=5, P=.0001).

In addition to the program described above, special projects were undertaken by other members of the Chaco Project staff, by University of New Mexico students, and by specially contracted experts

Table 3.2. Description of the chipped stone artifact types and other variables recorded during analyses.[a]

Artifact Type	Description
202	Stemmed projectile point with a narrow distal end for hafting without notches.
203	Corner-notched projectile point. Bifacially flaked piece with a point at the proximal end. Distal end consists of haft with notches emanating from the base.
204	Side-notched projectile point. Same as 203 except notches emanate from the side.
205	Stemmed projectile point blade fragment. Triangular point. Bifacially flaked with triangular shape and no visible hafting element.
206	Corner-notched projectile point/blade fragment.
207	Side-notched projectile point/blade fragment.
208	Large-shouldered point.
209	Miscellaneous blade fragment. Small non-hafted blade. Bifacially flaked piece without visible hafting elements.
210	Large non-hafted blade. Large bifacially flaked piece without visible hafting elements.
211	Side scraper. Steep unifacial retouch along the long axis of the piece. Retouch may extend over one face.[a]
212	End scraper.[a]
213	Small non-hafted blade. Small bifacially flaked piece without visible hafting elements.
214	Asymmetrical bifacially flaked piece. Asymmetrical distal end consists of side-notches for hafting. Point or drill.
215	Large corner-notched point.
216	Rocket point.
217	Miscellaneous unclassified tool.
218	Renotched side-notched point. Side-notched points broken at minimum stem width then renotched on the blade above the break.
219	Large side-notched point.
220	Contracting base point.
221	Knife. Bifacially flaked piece with bifacial retouch or bifacial edge damage along one or more edges.[a]
223	Saw (and denticulates).[a]
231	Formal drill. Manufactured projection exhibiting retouch on tip or sides of projection.
233	Gouge, chisel.
234	Informal or fortuitous perforator. Natural projection exhibiting retouch on tip or sides of projection.
235	Projection on flake.
236	Micro drill.
237	Micro fortuitous perforator.
238	Piece esquille.
239	Symmetrically waisted point.

Table 3.2. (continued)

Artifact Type	Description
241	Utilized flake: Any piece that exhibits evidence of edge damage due to use; i.e., step flaking, feathered flaking, nibbling, polishing, rounding, etc. The wear must be heavy enough to distinguish it from fortuitous damage due to processing or storage (bag wear). This decision was occasionally somewhat subjective.
242	Retouched flake: A piece that exhibits intentional retouch on one or more edge or faces, but does not correspond to defined tool categories. Intentional retouch is distinguished from edge damage (utilization) on the basis of size and regularity of flaking. Intentional retouch generally consists of large, regularly spaced feathered flaking emanating from the edge.
243	Whole flake: A piece exhibiting platform, bulb of percussion and full distal end.
249	Angular debris: A piece exhibiting no positive or negative bulb of percussion but with the remains of flake production evident, including portions of flake-scars, ripple marks, etc.
251	Core: A piece of material that does not exhibit a bulb of percussion and from which two or more flakes, 2 cm or more in length, have been removed.
299	Other chipped stone: Any retouched piece that does not fit into the above-tool categories.
770	Raw material: Pieces of silicious stone that show no signs of use or manufacture, but are large enough to permit flake production or tool manufacture.

Material type: Warren's 4-digit code (See Appendix 3B).

Cortex: The number of pieces from a material type and artifact type subgroup that exhibited cortex.

Frequency per group: The number of pieces in a material type and artifact type subgroup.

Field specimen number: A sequential field catalog number (Windes 1984).

Weight: The weight of each material type and artifact type subgroup was recorded to the nearest tenth of a gram.

[a]Types 211, 212, 221, and 223 were used in an earlier analysis as labels for 27 tools that were lost after the preliminary sort.

(Table 3.5). Specialist analyses included a geological study of chipped stone material sources in the Chaco Canyon area, X-ray fluorescence analysis of obsidian artifacts, and specialized analyses of formal tools. Student projects included experimental analyses of use-wear patterns and detailed analyses of projectile points, cores, and debitage.

Sites/Sampling Biases

The chipped stone database was the result of sampling at a number of levels. On the canyon level, the selection of sites for excavation did not include the full range of site types present in the canyon, nor a full temporal sequence. On the site level, selection of proveniences to be excavated and inconsistent use of screening as a field recovery technique introduced variability in the amount and type of chipped stone recovered. Circumstances specific to certain sites also produced variation in the resulting chipped stone data (See Unusual Proveniences p. 592). For example, at sites 29SJ 423 and 29SJ 1360, where screening had not been a routine procedure, backdirt was later screened, adding to the chipped stone recovered. A brief description of each site included in the present analysis is provided in Table 3.6, including an estimate of the percentage of the site dug, recovery procedure used, and types of proveniences contributing chipped stone.

The Time-Space Matrix

Ideally, the spatial and temporal systematics used in this report would have been defined and refined through the pooled analyses of various artifact classes, site architecture and stratigraphy, and absolute dates. In 1979, however, when final analyses were to begin, the Chaco Project had not begun to produce such a temporal-spatial framework. The systematics available at that time had not advanced beyond the original field collection units and proveniences.

Table 3.3. Attributes used in detailed analysis form.

Variables		Form 1	Form 2	Form 3	Form 4
11	Material type	x	x	x	x
12	Length	x	x	x	x
13	Amount of cortex	x	x	x	
14	Width			x	x
15	Platform type	x	x	x	
16	Flake Type	x	x	x	x
17	Location of manufacture	x	x	x	x
18	Edge morphology			x	x
19	Surface utilized		x	x	
20	Location of wear		x	x	
21	Wear pattern	x	x	x	
22	Orientation of striae			x	
24	Length of utility edge			x	x
	Tool type		x	x	
23	Edge angle	x	x	x	x
	Condition of cortex	x	x		
	Weight		x		
	Overall tool manufacture		x		
	Degree of wear		x		
	Edge outline		x		
	Wear association of edge 1 to edge 2		x		
	Lateral sinuosity		x		

It was imperative that a higher level framework be devised that would be useful for all analyses, particularly if there was any hope in the future of comparing the quantified results of the individual analyses. The most expedient solution to this problem was found in a generalized time-space matrix. The excavator of each site, using the available ceramic data and absolute dates, defined temporal spans appropriate to the architecture and stratigraphy of each site; these spans were then synthesized into a master temporal framework, which formed one axis of the matrix. Similarly, very broad depositional and architectural classes were defined for each site and then synthesized into the other axis of the matrix (Table 3.7). Ideally, each field collection unit or provenience could then be placed into one cell of the time-space matrix. For example, pitstructure trash fill from several sites might date from A.D. 1120 to 1220—these proveniences could then be lumped into a single cell.

The time-space matrix provided a common framework for inter-site analysis of each artifact class and, at the same time, offered systematics for higher level integration. It should be noted, however, that the matrix constituted a quick fix to a tremendously complex problem and should have been viewed as only the first step in the development of descriptive systematics for Chacoan materials.

The application of the time-space matrix to the chipped stone assemblage produced 280 cells. In each cell were grouped all chipped stone from all sites that fit into the appropriate time and space categories; i.e., all chipped stone from trash mounds dating from A.D. 920 to 1020 (chipped stone was <u>not</u> found in all

Table 3.4. History of use of detailed analysis.

Analyst	Date	Sites	Artifact Types Selected	Form Used
Cameron	1975-77	29SJ 299	All chipped stone	1
		29SJ 721	All chipped stone	
		29SJ 389/1976 Material	All chipped stone	
Truell	1977	29SJ 627 Kiva C	All chipped stone	2
Schutt	1978	29SJ 628	All chipped stone	3
Cameron/Truell	1978	29SJ 629	Utilized and retouched flakes	3
		29SJ 627	Utilized and retouched flakes	
Cameron	1979	29SJ 389	Utilized retouched flakes and tools	3
		29SJ 423		
		29SJ 627		
		29SJ 629		
		29SJ 630		
		29SJ 633		
		29SJ 724		
		29SJ 866 (Stone Circle)		
		29SJ 1360		
		29SJ 1419 (Stone Circle)		
		29SJ 1659		
Cameron	1981	29SJ 389	Retouched flakes not previously analyzed	4
		29SJ 391		
		29SJ 423		
		29SJ 626		
		29SJ 627		
		29SJ 629		
		29SJ 630		
		29SJ 633		
		29SJ 724		
		29SJ 866 (Stone Circle)		
		29SJ 1360		
		29SJ 1419 (Stone Circle)		
		29SJ 1565 (Stone Circle)		
		29SJ 1947		
		29SJ 1976 (Stone Circle)		

Table 3.5. Other studies of lithic materials.

Analyst	Date	Project and Reference
David W. Love	1979-81	Geological description of chipped stone material source. Appendix 3A.
R. Lee Sappington	1979-82	X-ray fluorescence analysis of obsidian. Sappington and Cameron (1984).
Stephen Lekson	1979-82	Analysis of formal tools (Lekson, Chapter 4 of this volume).
Bruce Bradley	1979	Technological analysis of formal tools and examination of technological aspects of the primary technology (Bradley 1979).
LouAnn Jacobson	1976-82	Examination of chipped stone material types in the Chaco Canyon survey collections. Comparison of chipped stone material types in Chaco Canyon to those of other sites in the San Juan Basin (Jacobson (1977, 1984).
Catherine VerEecke	1977	Analysis of 200 projectile points (VerEecke 1977).
Bruce Moore	1976-78	Development of analytic form for cores and partial analysis of cores excavated before 1977 (Moore 1978).
Jeanne Schutt	1978-79	Analysis of all chipped stone from 29SJ 628 using detailed analysis form. No reference.
Bradley Lepper	1978-79	Replicative wear pattern experiments on silicified wood (Lepper 1979).
Charlotte Agnew	1979	Interpretation of core analysis using data collected by Bruce Moore. No reference.

Table 3.6. Description of sites excavated by the Chaco Project.

Site	Approximate Temporal Span (A.D.)	Architecture Present	% Room Block Excavated	% Trash Mound Excavated	Screened? Y/N	Proveniences Contributing Chipped Stone
29MC 184	750-850	3 Roomblocks Trash Mound	0	<5	Y	T.P.[a] 4 = 4 Test trenches
29SJ 299 (A)	610-690 910-930 1190-1220	2 Kivas 3 Pithouses Cists	80	0	N	T.P. 3 = 3 Pithouses fill and floor; 3 Rooms fill; Antechamber fill T.P. 6 = 1 Pithouse fill; 2 Rooms fill and floor;
29SJ 299 (B)	790-820	4 Rooms 1 Pithouse No Midden	80	0	N	T.P. 4 = 2 Pithouses fill, 1 Floor, 1 Room fill; Ramada fill
29SJ 391	930-1150/ 1250	1 Great Kiva Roomblock Pitstructures No Midden?	<1	0	Y	T.P. 6 = 5 Rooms fill, structural association T.P. 7 = 2 Rooms structural association T.P. 8 = 2 Floor fill, structural association
29SJ 389	980-1150?	Roomblocks Plazas Trash Mound	12	2.6	Y	T.P. 6 = 8 Rooms fill, 8 Floors, structural association, 11 Plaza grids fill, 4 Floors, Trash mound, Plaza Feature 1 T.P. 7 = 8 Rooms fill, 5 Floors, 4 Kivas fill, structural association, 9 Plaza grids fill, structural association, Trash mound, Other structural fill, East Ruin fill, Plaza Feature 1 fill, structural association, East Plaza fill 4 Floors, T.P. 8 = 3 Rooms fill, 1 Floor, 2 Kiva fill, 4 Plaza grids fill, Major Wall fill, Plaza feature 1 fill, Other structural fill, East Plaza fill
29SJ 423	510-620	10-15 Pitstructures 1 Great Kiva Trash Mound	5-10	<5	N Backdirt only	T.P. 2 = Surface, 3 Pithouse fill, 1 Floor, Great Kiva fill, roof, floor, Ramada fill, Trash mound, 1 Cist fill, Backdirt, T.P. 7 = 1 Pithouse surface
29SJ 626	P1-P11	Roomblock Pitstructure Trash Mound	0	<5	Y	T.P. 6 = 6 Test trenches
29SJ 627	770-1140	25 Rooms Pitstructure Trash Mound	75	10	1974=N 1975=Y	T.P. 5 = 1 Pithouse fill, floor, 1 Room fill, T.P. 6 = 5 Test trenches; 4 Pit fill; 18 Rooms fill, 8 Floor, 4 Kiva fill, 1 Floor, Antechamber fill, Ramada structural association, Trash mound T.P. 7 = 1 Test Trench, 1 Pit fill, 12 Rooms fill,5 Floor, 2 Kiva fill, 2 Floor, 1 Plaza fill, 1 Ramada fill, Trash mound
29SJ 628	600-830	7-10 Pitstructure Cists	70	0	N	T.P. 4 = 3 Pit fill, T.P. 6 = Surface, 1 Test trench, 3 Pit surface fill
29SJ 629	875/900-1030 1100-1140	9 Rooms, 3 Pitstructure 1 Kiva 1 Ramada	95	70	Y	T.P. 5 = 2 Test trench, 1 Room fill, Trash mound T.P. 6 = Surface, 7 Test trench, 3 Pit fill, 2 Floors, structural association 7 Rooms fill, 5 Floors, 3 Ventilators; 12 Plaza grids, fill, 1 Floor; 1 Ramada fill, Trash mound T.P. 8 = 1 Pithouse (subfloor only)

Table 3.6. (continued)

Site	Approximate Temporal Span (A.D.)	Architecture Present	% Room Block Excavated	% Trash Mound Excavated	Screened? Y/N	Proveniences Contributing Chipped Stone
29SJ 630	900-1150	1 Roomblock Pitstructure Trash Mound	(T)	<5	Y	T.P. 7 = 2 Test trench fill
29SJ 633	1150-1250	2 Roomblocks Pitstructures Trash Mound	unk.	0	Y	T.P. 8 = 2 Rooms fill, structural association; T.P. 12 = Surface, 2 Rooms fill, 1 Floor, structural association
29SJ 721	660-730 1090-1110	1 Room, 1 Kiva 3 Pitstructures No Midden	95	0	N	T.P. 4 = Surface; 2 Pithouses fill, floor, 2 Roasting pits; T.P. 7 = 1 Kiva floor
29SJ 724(A)	780-800	10 Rooms 1 Pitstructure Trash Mound	95	5.9	N	T.P. 4 = Surface; 1 Test trench; 1 Pithouse fill, floor, 9 Rooms fill, 6 Floors; 1 Ramada; Trash mound; Backdirt
29SJ 724 (B)	800-900	1 Roomblock Pitstructure Trash Mound	0	<5	Y	
29SJ 1360	820-1020	2 Roomblocks 5 Pitstructures Trash Mound	75	10	N Backdirt only	T.P. 4 = Surface; 2 Plaza areas fill, 1 Floor, Trash mound T.P. 5 = 1 Room fill, floor; 1 Ramada area fill, T.P. 6 = 6 Rooms fill, 2 Floors; 2 Kiva fill, 2 floor, 4 Plaza area fill, 1 Floor, 2 Ramada areas fill, 1 Floor, Trash mound, Backdirt, Feature X
29SJ 1659	510-710	1 Great Kiva 20-30 Pitstructures Trash Mound	<1	<1	N	T.P. 3 = Surface, 2 Test trench, 1 Pithouse fill, floor, Antechamber, 2 Storage cists fill
29SJ 1947	1040-1150/ 1250	Roomblock Pitstructure Trash Mound?	0	unk.	Partial	T.P. 8 = Trash mound test trench

[a] T.P. = Time Period - see Table 3.7.

Table 3.7. Time-space matrix.

X-Axis: Time		Y-Axis: Space	
No.	Date	No.	Provenience type
1	500-599	1	Ramada/living room fill
3	600-699	2	Ramada/living room floor
4	700-820	3	Storage room fill
5	820-920	4	Storage room floors
6	920-1020	5	Living room/storage room trash fill
7	1020-1120	6	Pitstructure trash fill
8	1120-1220	7	Pitstructure other fill
9	920-1120	8	Pitstructure floors
10	920-1220	9	Plaza/ramada fill
11	820-1220	10	Plaza/ramada surfaces
12	1220-1320	11	Trash midden fill
13	820-1020	12	Site feature fill/floors
14	1120-1300	13	Site surface
15	500-1200	14	Miscellaneous/other
16	920-1320		
17	1120-1320		
18	1020-1040		
19	700-1020		
20	Unknown		
21	1020-1220		
22	900-1130		
23	820-1120		
24	600-820		

possible time period and spatial categories). This report, however, uses only temporal periods of less than 100 years (except for Period 4), resulting in a total of eight periods (Periods 7 and 18 were combined). These periods account for 25,522 pieces of chipped stone, almost 75 percent of the total.

Analytical Dimensions

Materials

Material was classified using a system developed by A. H. Warren for the Museum of New Mexico, Laboratory of Anthropology (Warren 1967). This system identifies materials by a four-digit code. (See microfiche in back of volume for illustration of types.) The types used by the Chaco Project were further described by Love (Appendix 3A) and the sources of these materials were identified. Information from locally available chipped stone material can be used to examine raw material preferences, change over time in the selection of raw material, and task-specific selection of raw material. Regionally, the presence of exotic materials in the Chaco assemblage can be used to investigate the nature and magnitude of relations with surrounding areas.

Five types of exotic materials were identified in the canyon in significant amounts. The source of most of these materials was more than 50 km from Chaco Canyon (Figure 3.1).

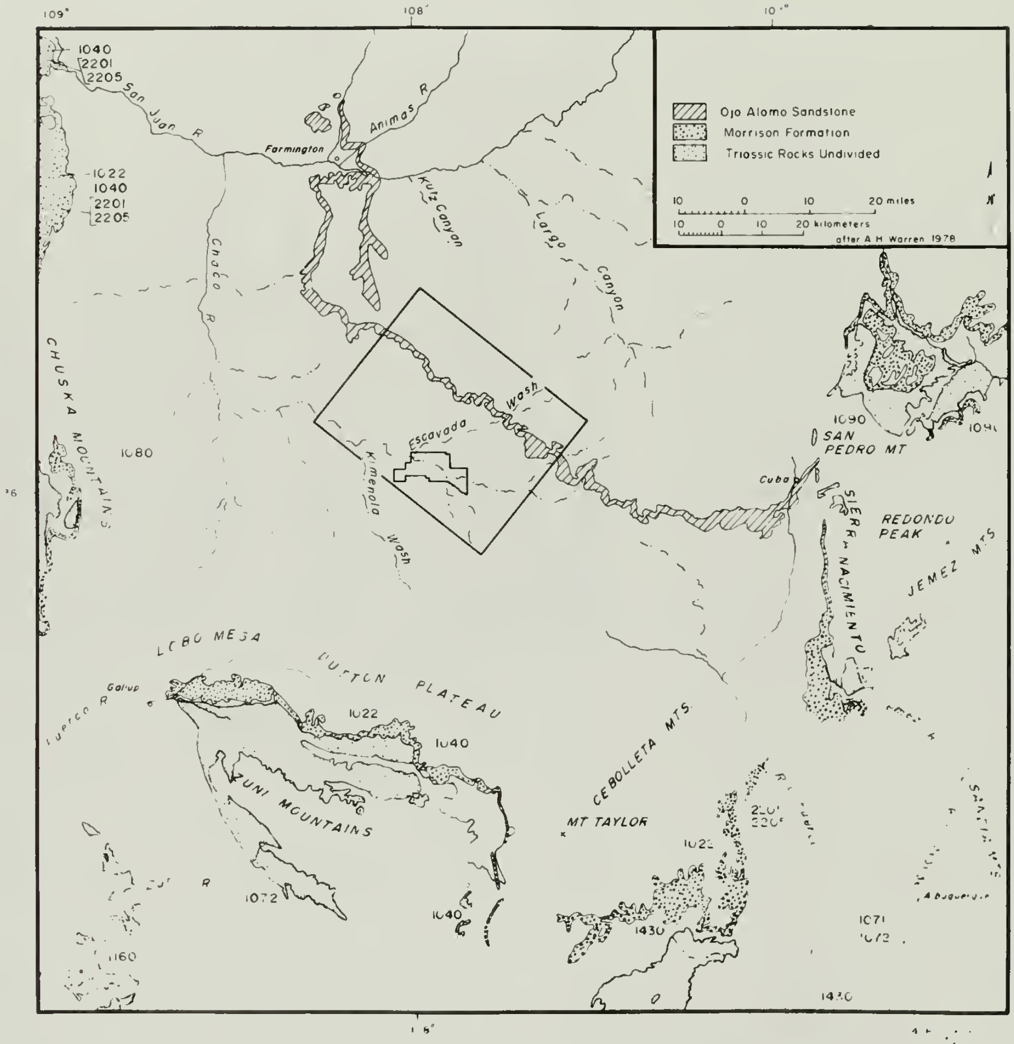

Figure 3.1. Sources of chipped stone exotic to Chaco Canyon.

Key for Figure 3.1. Lithic Codes.

Lithic Code	Description
1022	Morrison Formation. Pastel-colored chert with quartzite grains
1040	Morrison Formation. Chert and silicified clastic rocks
1071	Peloidal ("oolitic") yellow-brown chert (jasper)
1072	Yellow-brown chert (jasper with mossy black inclusions)
1080	Washington Pass chert
1090	Pedernal chert
1160	Colored chalcedonic wood from Chinle Formation
1430	Morrison Formation near Laguna. Chalcedony
2201	Silicified clastic sediment of Brushy Basin Member
2205	Silicified fine-grained quartzose, sandstone

1) Morrison Formation cherts and quartzitic sandstone (Codes 1020, 1022, 1040, 2201, 2205).
2) Zuni chert (Code 1072).
3) Washington Pass chert (Codes 1080, 1081).
4) Zuni petrified wood (Codes 1160, 1161).
5) Obsidian (Codes 3500-3604).

Obsidian originated in at least 12 different locations (Cameron and Sappington [1984] but see Windes [1993:304] for a reanalysis of these sources) (Figure 3.2), but for much of this discussion, obsidian will be treated as one material type.

Local materials were primarily silicified woods as well as cherts derived from gravel terraces (see Love, Appendix 3A). For the purposes of this discussion, these local materials were combined into six groups, based on the frequency and similarity of the types and the patterning in chipped stone at each individual site. Generally, the following groups of local materials will be used:

1) High surface (gravel terrace) cherts (Codes 1050-1055).
2) Light and dark cherty silicified wood (Codes 1112-1113).
3) Light and dark splintery silicified wood (Codes 1109-1110).
4) Light and varicolored chalcedonic silicified wood (Codes 1140-1145).
5) Quartzite (Codes 4000-4005).
6) All others.

Technology

In general, formal tools comprise only a small proportion (less than 5 percent of most Anasazi chipped stone assemblages (Kidder 1932; Schutt 1981; Simmons 1982; Woodbury 1954). Primary or secondary flakes were frequently used as informal tools. These flakes were marginally retouched, in some cases to produce the desired edge shape or angle, but most often they were not retouched at all. Lack of formality in the Anasazi technology also extends to flake production, where flakes were generally removed in a haphazard manner with little evidence of platform preparation or regularity of flaking (Bruce Bradley, personal communication, 1979). The goals of a study of this sort of technological system will be different than those of studies describing a highly formalized technology.

The objectives of the technological study of the Chaco assemblage were as follows: 1) identification of procurement strategies; how chipped stone material was acquired and the form in which it was brought back to the site, 2) examination of the stages in the process of tool manufacture (including identifying informal flake tool production as well as the production of formal tools), and 3) examination of the variability in these technological processes through time and space.

Strategies of chipped stone procurement, reduction, and use operate within a framework of environmental adaptation (Chapman 1977; Chapman and Schutt 1977; Schutt 1981). Factors such as availability of raw material, distance to raw material sources, mobility, trade, and functional requirements (among others) affect the technology employed by a group. These strategies can be identified archeologically by examining the form, frequency, and distribution of the by-products of chipped stone manufacture. Changes over time in the manner in which a particular raw material is acquired, processed, and used can provide evidence of a change in access to source materials or, perhaps, shifts in the values attributed to different source materials.

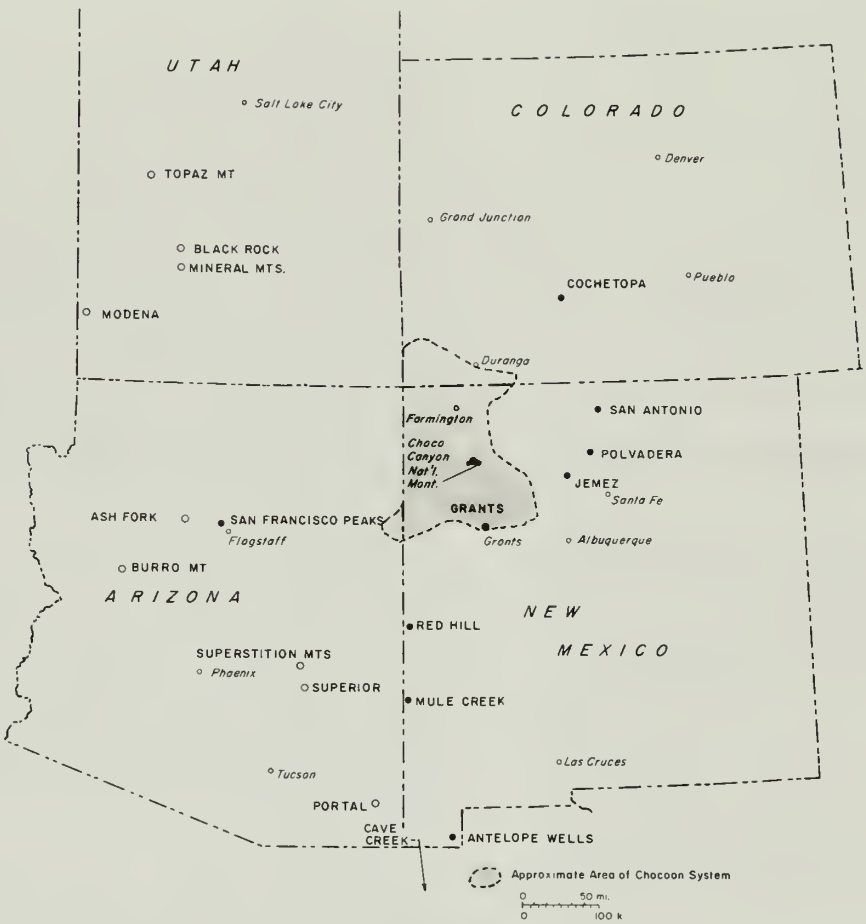

Figure 3.2. Sources of obsidian found in Chaco Canyon.

Change over time in the skill with which a particular material was worked, the amount of chipped stone processed or used, or the concentration of chipped stone debris in specialized "workshop" areas may represent evidence of changes in broader socio-economic systems.

Artifact types defined for this analysis (Table 3.2) are those that have broad implications for both technology and function (debitage, utilized flakes, retouched flakes, projectile points, drills, scrapers, etc.) and are commonly used in analyzing large quantities of chipped stone (Nelson 1981; Shelley 1980). Although formal tools were further subdivided for stylistic variation and a few unusual types were defined (see Lekson, Chapter 4 of this volume), these subdivisions are generally not used in the present analysis. Formal tools were considered any piece with retouch covering more than one-third of one or both faces.

The distribution of artifact types can suggest the location of different stages in the process of raw material reduction or tool manufacturing. For example, proveniences containing cores, unutilized whole flakes, and angular debris would signal the location of raw material reduction or flake production. In the same provenience, the association of other artifact classes, such as hammerstones or other flaking instruments would support such an identification. Alternatively, the co-occurrence of many utilized or retouched flakes, in the absence of debitage or manufacturing tools, would suggest tool use rather than manufacture. The location of the production of formal tools would be suggested by the presence of biface thinning flakes and incomplete or broken-in-manufacture tools, as well as the association of special manufacturing tools, such as pressure flakers. Unfortunately, the present analysis did not record biface thinning flakes as a separate type; the presence of many very small flakes, however, might be used to infer the production of formal tools.

Some assumptions that guide chipped stone analysis must be evaluated for their applicability to the Chaco assemblage. For example, the presence of cortex on the dorsal surface of a flake is sometimes used as an indication that bulk raw material was brought to the site for processing. In Chaco Canyon, however, the use of cortex on flakes as an indication of the stage of manufacture represented by chipped stone debris is not applicable to all materials. Most chipped stone in Chaco Canyon is silicified wood, which may be derived from petrified logs. This material may have partially filled fractures with a surface texture similar to cortex (Love, Appendix 3A). In this case, the use of cortex on flakes as a diagnostic of stage of manufacture might be erroneous. Silicified wood also occurs as pebbles; however, the conventional interpretations of cortical flakes would be correct in this case. Of the exotic materials, some occur in bedrock strata, while others occur as alluvial deposits (Appendix 3A). Even if the original form is in bedrock strata, however, pebble deposits of the same material may also occur nearby. Finally, the form in which some exotic materials occur is unknown. Of the material commonly found in Chaco Canyon, only high surface gravels can be confidently used in making interpretations concerning manufacture stage from the presence or absence of cortex.

Procedures

The preliminary sort was integrated with the general inventory of other classes of artifacts and the ceramic rough sort. Chipped stone from each bag (which contained all chipped stone from a single provenience) was initially sorted into Warren's material types. Each piece was then examined at 10X under a stereoscopic microscope and pieces within each material type were classified by artifact type (described below). The material type, artifact type and frequency, number of pieces with cortex, total weight, and provenience information were recorded on coding sheets. The coded provenience included site number, major provenience type and number, fill characteristic, story, layer, level, feature type, feature number, and feature fill characteristic. Thus, the unit of record was all pieces of one material type and one artifact type (for example, five utilized flakes of Washington Pass chert), and frequency was an attribute of that unit of record. This process was repeated for each material and artifact subgroup in the bag. Table 3.2 shows artifact types as well as other attributes recorded during the preliminary sort.

Material Selection

Locally available material was overwhelmingly selected for chipped stone manufacture throughout the Anasazi occupation of the canyon (Table 3.8). These local types (described in Appendix 3A) are primarily silicified woods, cherts, chalcedonic silicified wood,

Table 3.8. Material type by time period: Exotic versus local.

	Period															
	2 A.D. 500s		3 A.D. 600s		4 A.D. 700-820		5 A.D. 820-920		6 A.D. 920-1020		7 A.D. 1020-1120		8 A.D. 1120-1220		12 A.D. 1220-1320	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Exotic	146	5.0	29	10.0	38	3.0	17	2.0	382	4.0	2,221	30.0	750	33.0	55	12.0
Local	2,675	95.0	259	90.0	1,279	97.0	667	98.0	9,774	96.0	5,298	70.0	1,526	67.0	395	88.0
Total	2,821		288		1,317		684		10,156		7,519		2,276		450	

and, less frequently, quartzite. Non-local material was selected for use in all time periods but became most frequent during the later periods. Of the five exotic types found in large quantities, Washington Pass chert is by far the most frequent. Obsidian seems to have originated from a number of sources, although primarily from the Jemez area. Other exotics are less frequent, but in some cases do seem to show temporal variability.

Temporal Patterning

Local Material

Of the local materials, high surface chert shows a steady decrease in use through time, being most prevalent during the A.D. 500s (Table 3.9). The chipped stone assemblage from this time period was derived from a single site (29SJ 423), thus predominance of high surface cherts may be conditioned by factors unique to that occupation. Cherty silicified wood averages about 30 percent from A.D. 700 to 1020 and then it drops off abruptly at about the same time exotic materials begin to increase in frequency. Splintery silicified wood shows some fluctuation over time, but it is common only from A.D. 1020 to 1120. Chalcedonic silicified wood is present in high quantities throughout the temporal sequence except from A.D. 1020 to 1220. Like cherty silicified wood, it seems to have been replaced by exotic material. Quartzite, while never abundant, peaks once in the A.D. 500s and again from A.D. 1020 to 1120, and is accompanied by a high frequency of another coarse-grained material, splintery silicified wood. Miscellaneous material (other) forms a fairly steady 10 to 15 percent of each temporal group, except for the period from A.D. 1220 to 1320. This may again be the result of factors other than time, since only one site (29SJ 633) dates to this span.

Exotic Material

Exotic materials constitute less than 10 percent of chipped stone assemblages until A.D. 1020; in fact, they generally comprise less than 5 percent during these early periods (Table 3.8). (Period 3 contains an abnormally high frequency of surface-collected obsidian tools; see Site/Sampling Bias and Materials). Exotic frequencies rise to 30 percent and above from A.D. 1020 to 1220 and then become much less frequent from A.D. 1220 to 1320.

Washington Pass chert is by far the most frequent exotic (Table 3.9), peaking in frequency during the period A.D. 1020 to 1120, and constitutes over one-fifth of the total material recovered. Material from the Morrison Formation is never very abundant, comprising only 4.3 percent of the assemblage during the A.D. 1020 to 1120 period. This is also true of Zuni wood, which reaches its maximum (2.8 percent) during the same period (A.D. 1020 to 1120).

Yellow-brown spotted chert (also called "Chinle chert") is also generally infrequent, but is most common 100 years later (A.D. 1120 to 1220). The same is true of obsidian, which reaches a peak of 7.4 percent during this time period (A.D. 1120 to 1220). Obsidian is also quite frequent during the A.D. 500s and 600s; but, as will be seen later, the form in which the obsidian is found during the early periods is different from that found in A.D. 1120 to 1220.

The most striking temporal change seems to have occurred from A.D. 1020 to 1120 (perhaps beginning in the previous 100 years). Washington Pass chert (a material originating some 80 km from Chaco Canyon) becomes very frequent. It is accompanied by relatively high frequencies of other exotics and by two local materials of low workability, splintery silicified wood and quartzite. With the possible exception of the high surface cherts, the frequencies of local materials seem to be fairly constant, except during the incursion of exotic material when the proportion of local materials in the assemblage decreases significantly.

Obsidian. Obsidian found at sites in Chaco Canyon originated from at least twelve distinct sources (Figure 3.2 and Table 3.10). X-ray fluorescence was used to identify the source of 626 of the 679 pieces recently excavated (Cameron and Sappington 1984). (Subsequent reanalysis of a number of these pieces has shed some doubt on the reliability of aspects of the original source identification [Windes 1993]. Unfortunately, it has not been possible to incorporate this new analysis into the present study.)

Table 3.9. Material type by time period.

	Period																
	2 A.D. 500s		3 A.D. 600s		4 A.D. 700-820		5 A.D. 820-920		6 A.D. 920-1020		7 A.D. 1020-1120		8 A.D. 1120-1220		12 A.D. 1220-1320		
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	Total
Morrison Formation material	24	0.9	2	0.7	2	0.2	3	0.4	38	0.4	327	4.3	59	2.6	4	0.9	459
Yellow-brown spotted chert	14	0.5	1	0.3	7	0.5	2	0.3	31	0.3	67	0.9	68	3.0	11	2.4	201
Washington Pass chert	19	0.7	4	1.4	7	0.5	4	0.6	212	2.1	1,589	21.1	430	18.9	31	6.9	2,296
Zuni wood	1	0	0	0	2	0.2	1	0.1	15	0.1	209	2.8	26	1.1	0	0	254
Obsidian	88	3.1	22	7.6	20	1.5	7	1.0	86	0.8	29	0.4	167	7.3	9	2.0	428
High surface chert	963	34.1	58	20.1	227	17.1	66	9.6	876	8.6	433	5.8	224	9.8	66	14.7	2,913
Cherty silicified wood	314	11.1	37	12.8	308	23.2	297	43.4	3,336	32.8	1,249	16.6	321	14.1	38	8.4	5,900
Splintery silicified wood	79	2.8	27	9.4	60	4.5	44	6.4	735	7.2	1,320	17.6	192	8.4	14	3.1	2,471
Chalcedonic silicified wood	821	29.1	90	31.3	504	38.0	184	26.9	3,410	33.6	865	11.5	377	16.6	153	34.0	6,404
Quartzite	142	5.0	8	2.8	32	2.4	15	2.2	290	2.9	524	7.0	77	3.4	14	3.1	1,102
Other	356	12.6	39	13.5	157	11.8	61	8.9	1,129	11.1	907	12.1	335	14.7	110	24.4	3,094
Total	2,821		288		1,326		684		10,158		7,519		2,276		450		25,522
Percent of Totals		11.1		1.1		5.2		2.7		39.8		29.5		8.9		1.8	

Table 3.10. Obsidian sources.

Source	No.	%
New Mexico		
Jemez	397	58.5
Grants Ridge	26	3.8
Polvedera Park	46	6.8
Red Hill	143	21.1
San Antonio Peak	4	0.6
Mule Creek	8	1.2
Arizona		
Government Mountain (San Francisco Peaks)	9	1.3
Superior	3	0.4
Sitgreaves Peak (San Francisco Peaks)	16	2.4
Utah		
Modena	3	0.4
Mineral Mountains	17	2.5
Colorado		
Cochetopa	3	0.4
Miscellaneous	4	0.6
Total	679	100.0

Table 3.11 shows the frequency of each type of obsidian by time period (with sources in Utah combined). Over 50 percent of the obsidian has been identified as Jemez and 25 percent as Red Hill (no other source exceeds 10 percent). Of the less frequent sources, those originating in Utah seem to occur most often in the early periods, while other low frequency material is scattered throughout all periods. Figure 3.3 graphs the relative frequencies of the three most frequent sources through time with all other sources combined. About A.D. 700, there seems to be a temporal shift in the direction of trade from Red Hill in the early periods to Jemez in the later periods. Entry of Jemez obsidian into Chaco Canyon seems to have peaked during the period from A.D. 1120 to 1220. Polvedera Peak obsidian, a source located near Jemez, occurs in low frequencies through time (the higher frequencies from A.D. 820 to 920 are a function of a very small sample size). Other sources are also rather evenly distributed throughout time, although they seem to become less frequent in later periods.

The form in which obsidian arrived in Chaco Canyon varies over time. A ratio of the number of pieces of debitage to the number of tools was calculated for early periods (pre-A.D. 920) and late periods (post-A.D. 920) for the three most frequent obsidian types. A high ratio would represent many flakes per tool and a low ratio would represent a few flakes per tool (Table 3.12).

During the early periods, Red Hill obsidian arrived as bulk material (raw material, cores, and flakes). During the late periods it was probably procured more frequently as finished tools. Exactly the opposite relationship is found with Jemez obsidian, where finished tools seem to have been imported during the early periods and bulk material imported during the late periods. The Polvedera Peak source shows little change in this relationship over time, and the low ratio here would indicate that this material was generally procured as finished tools.

The presence of obsidian cores would indicate that the reduction of obsidian was occurring in the canyon. Ten obsidian cores were recovered; five were from a single provenience. The remaining five are from four different sources. This small sample cannot accurately be used to support statements about temporal variability in obsidian manufacturing activities.

Chipped stone data from earlier excavations is pertinent to some of the discussion above. At Shabik'eshchee Village (29SJ 1659), which dates from about A.D. 600 to 700, Roberts (1929) noted that almost half of the excavated projectile points were obsidian. (None of this material was subjected to X-ray fluorescence by the Chaco Project and thus the source of these obsidian artifacts is unknown.) Roberts also noted "caches" of obsidian and chalcedony, but it is not clear whether this indicates concentrations of raw material, the remains of tool-making activity, or merely the remains of retouch or resharpening.

At Kin Kletso, Vivian and Mathews (1965) note that about one-third of all flake tools and a third of all "scrap" are obsidian. This site dates to about A.D. 1130 or later, the same period when larger quantities of bulk obsidian were found at more recently excavated sites. The proportion of formal tools that are made of obsidian at Kin Kletso is much smaller than the proportion of this material of flake tools or "scrap." Assuming that the obsidian found at Kin Kletso is from Jemez (as indicated by the four pieces

Table 3.11. Obsidian sources by time.

	Period																	
	2 A.D. 500s		3 A.D. 600s		4 A.D. 700-820		5 A.D. 820-920		6 A.D. 920-1020		7 A.D. 1020-1120		8 A.D. 1120-1220		12 A.D. 1220-1320		Total	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Jemez	1	1.1	5	21.7	8	40.0	1	14.3	40	46.5	19	65.5	148	88.6	7	77.8	229	53.4
Grants	4	4.5	-	-	3	15.0	1	14.3	8	9.3	2	6.9	-	-	-	-	18	4.2
Polvedero	7	8.0	3	13.0	1	5.0	3	42.9	8	9.3	3	10.3	8	4.8	-	-	33	7.7
Red Hill	61	69.3	10	43.5	5	25.0	2	28.6	24	27.9	1	3.4	3	1.8	2	22.2	108	25.2
Mule Creek	-	-	-	-	1	5.0	-	-	-	-	1	3.4	2	1.2	-	-	4	0.9
San Francisco	3	3.4	2	8.7	-	-	-	-	2	2.3	2	6.9	4	2.4	-	-	13	3.0
Superior	-	-	1	4.3	-	-	-	-	2	2.3	-	-	-	-	-	-	3	0.7
Modena	11	12.5	2	8.7	1	5.0	-	-	1	1.2	1	3.4	1	0.6	-	-	17	4.0
Cochetopa	1	1.1	-	-	1	5.0	-	-	-	-	-	-	-	-	-	-	2	0.5
Miscellaneous	-	-	-	-	-	-	-	-	1	1.2	-	-	1	0.6	-	-	2	0.4
Total	88		23		20		7		86		29		167		9		429	

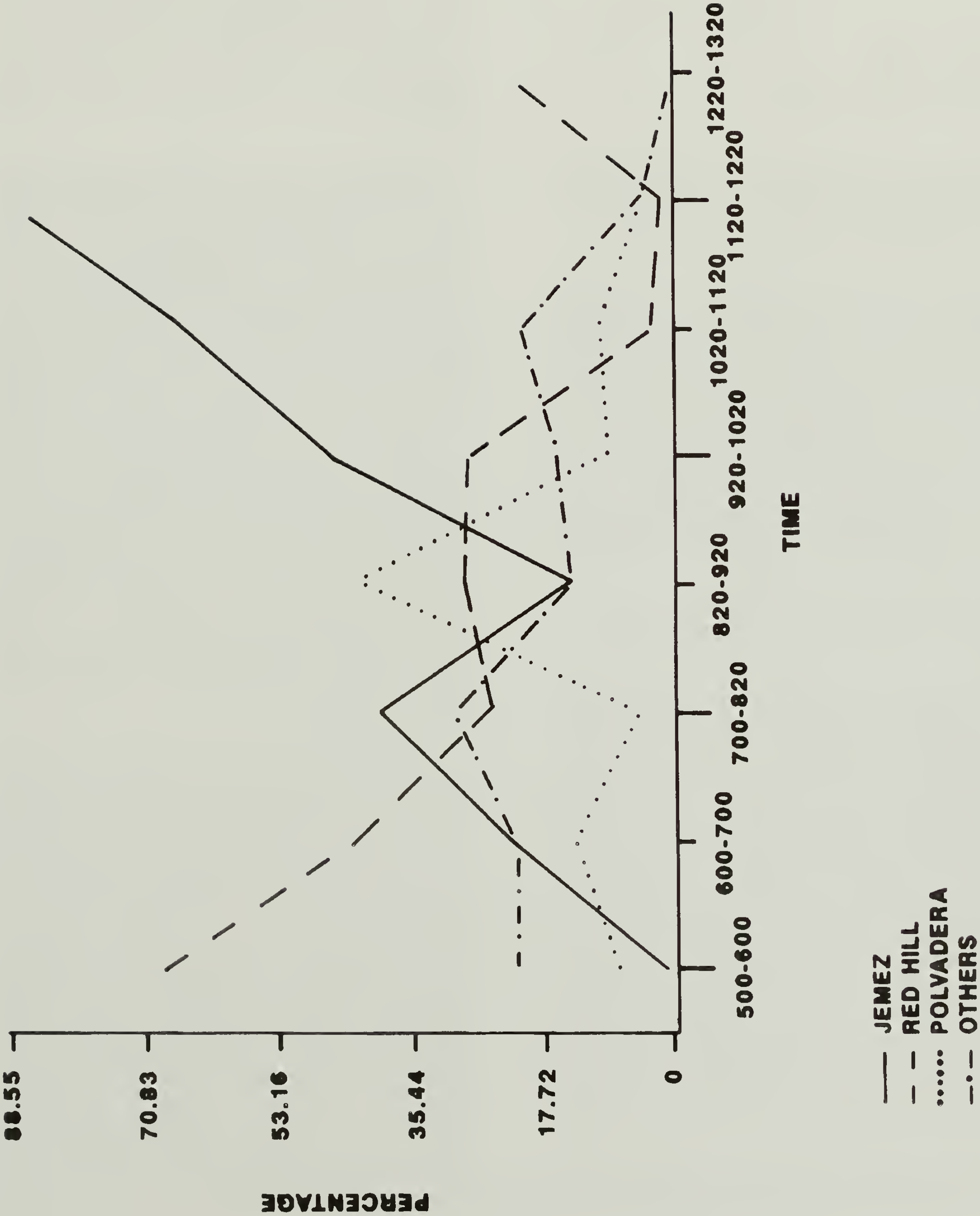

Figure 3.3. Temporal variation in obsidian.

Table 3.12. Ratio of debitage to tools for three obsidian sources.

	Jemez	Polvedera	Red Hill
Early (A.D. 500-920)	1.5	1.8	7.67
Late (A.D. 920-1320)	6.38	2.17	2.75

of obsidian from this site sent for X-ray fluorescence analysis [Cameron and Sappington 1984]), then the low frequency of obsidian tools during this period agrees with findings at recently excavated sites.

Contact with the south, where Red Hill Obsidian is located, seems to have been strongest during the period before A. D. 700. There are also indications in this early period of contact with sources in Utah. After A.D. 700, emphasis in obsidian procurement shifts east (Jemez obsidian), peaking between A.D. 1120 and 1220. Polvedera Peak obsidian use seems to have been steady, but perhaps not direct, as this material was probably acquired mostly as finished tools. The presence of other sources indicates that trade was widespread, but not intensive with these distant areas.

Acquisition Strategies: Local versus Exotic Materials

Artifact type frequencies for exotic and local materials change over time. Figure 3.4 graphs a ratio of "debitage" (utilized and retouched flakes, cores, whole flakes, angular debris, and raw material) to formal tools for both local and exotic material. (Surface material from site 29SJ 1659 was eliminated from these calculations; see Special Proveniences). A high value (few flakes per tool) suggests that the material was imported to the site as finished tools. A low value (many flakes per tool) might reflect either the manufacture of tools or simply production of flakes. Although the curve is quite erratic, ratios for local material are consistently much higher than for exotics. This reflects both the larger quantities of local material in the collections and, in part, the composition of the proveniences within these time periods (see Table 3.9).

Exotic materials have very low ratios of tools to debitage in the early time periods, indicating that exotic material was mostly brought in as finished tools. From A.D. 1020 to 1120, the ratio increases dramatically and then decreases slightly from A.D. 1120 to 1320, suggesting that exotic material was not only acquired as finished tools, but also as raw material, or cores. Access to these materials was either more direct or intensity of the trading system had increased.

The ratio of tools to debitage for specific exotic materials (Table 3.13) increases during time periods when these materials are most frequent. (Yellow-brown spotted chert had one tool and Zuni wood had no tools, so they were eliminated from Table 3.13.) Obsidian tools occur consistently through all periods (except for the earliest periods and Period 8), yet ratios are very low. In general, obsidian probably arrived in Chaco Canyon as finished tools throughout most periods. (See above section on obsidian sources.) The ratio for Washington Pass chert increases about A.D. 920 and then decreases from A.D. 1220 to 1320, again suggesting import of bulk material rather than finished tools from A.D. 920 to 1120. Morrison Formation material shows high ratios from A.D. 500 to 600 and from A.D. 1020 to 1120. "Morrison Formation" actually includes five distinct types which show internal variability. Two types (Codes 1022 and 2205) are found in Chaco Canyon sites, primarily as tools, while three other types (Codes 1020, 1040, and 2201) are primarily flakes (Table 3.14).

In summary, acquisition strategies of exotic chipped stone material changed abruptly, beginning about A.D. 900. Exotics were most frequent from A.D. 1020 to 1120; during this period, they were acquired from areas primarily west or northwest of the canyon (Morrison Formation material and Washington Pass chert). Certain varieties of Morrison Formation material, however, may have been acquired only as finished tools during this period. Exotics from east of the canyon (only Jemez obsidian—see obsidian sources) were primarily acquired in bulk form during the period from A.D. 1120 to 1220. While acquisition of finished tools for an exotic material is an indication of trade with another area, acquisition of bulk material (raw material, cores, flakes) may indicate increased control of or direct contact with the source by the inhabitants of the canyon.

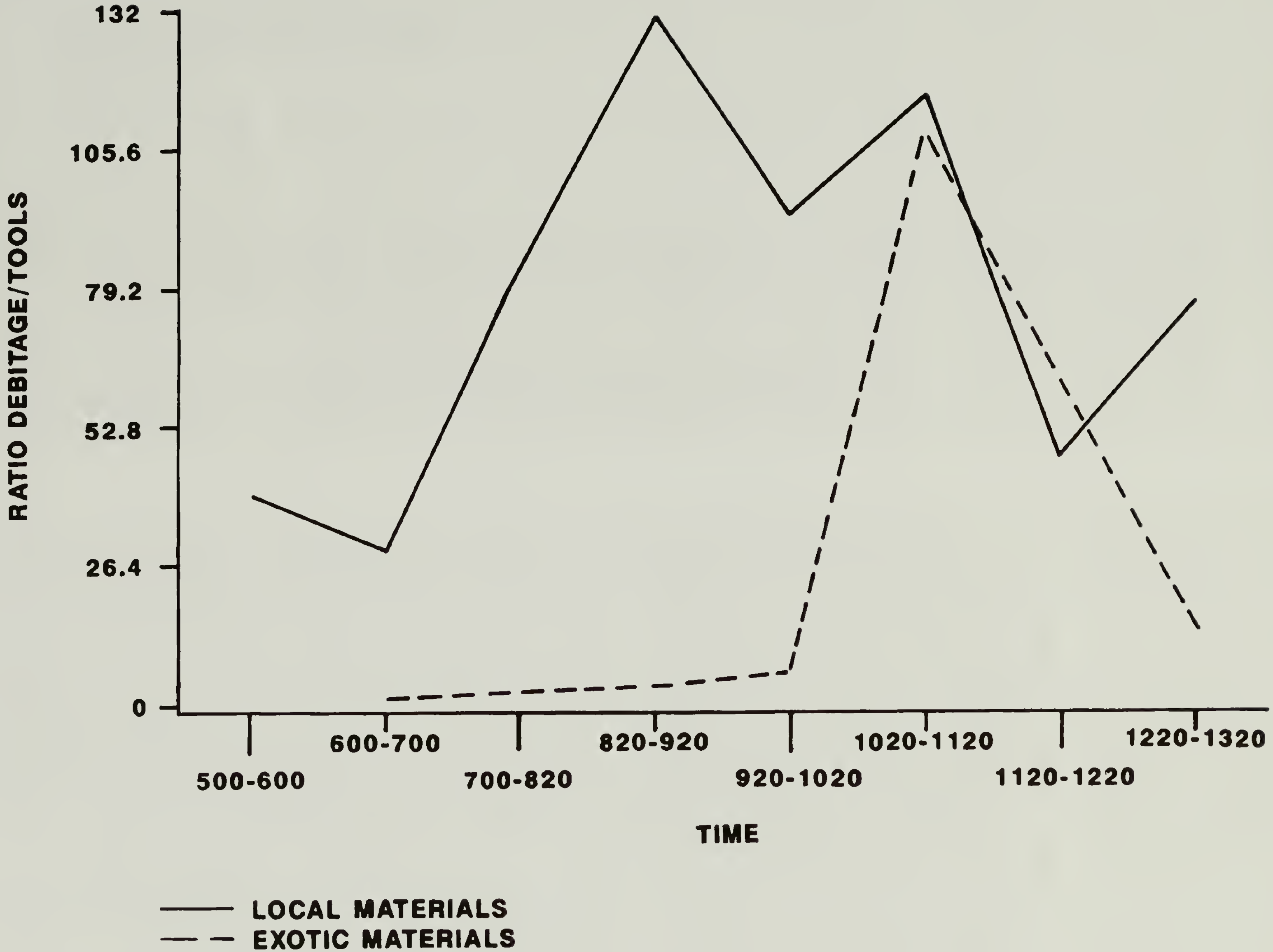

Figure 3.4. *Ratio of debitage to tools for exotic and local material by time.*

Table 3.13. Ratio of debitage to tools—exotic materials.

	Period							
Material	2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
Morrison Formation material	23.0	-	1	(NT)	7	39.8	6.4	(NT)
Washington Pass chert	8.5	-	2.5	(NT)	69.6	396.3	213.5	30
Obsidian	13.7	-	3	1.3	1.6	2.6	82.5	3.5

NT = No tools.

Table 3.14. Comparison of tools to debitage for materials from the Morrison Formation.

	Period								
Material	2 A. D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320	Total
1020, 1040, 2201									
Tools	1	-	-	0	3	0	0	0	4
Debitage	20	-	-	2	33	315	49	4	423
1022, 2205									
Tools	0	2	1	-	2	8	8	-	21
Debitage	3	0	1	-	2	4	2	-	6

Key to Materials:
- 1020 Miscellaneous chert.
- 1040 Morrison Formations cherts and silicified clastic rocks.
- 2201 Silicified clastic sediment of Brushy Basin member.
- 1022 Pastel-colored chert with quartz grains, Morrison Formation.
- 2205 Silicified fine-grained quartzitic, sandstone.

Local versus Exotic Material Variations Between Greathouse and Small-house Sites

Sites in Chaco Canyon have been classed as greathouses (large planned structures) and small-house sites (small, accretional structures) (Vivian and Mathews 1965). As greathouses only existed from A.D. 920 to 1220, only these periods will be examined (the vast majority of the material from greathouses is from Pueblo Alto; most of the remainder is from Una Vida). The sample from A.D. 1120 to 1220 includes only 74 flakes from small-house sites, too few to compare with material from greathouse sites during this period.

During some periods, the material distributions between these two site types (Table 3.15) suggests differential access to exotic material sources through time at greathouse and small-house sites. All exotics are proportionally more abundant in greathouse sites than in the small-house sites. From A.D. 920 to 1020, however, the difference in relative frequencies of exotics is slight. From A.D. 1020 to 1120, there is a marked increase in Washington Pass chert at greathouses, accompanied by an increase in Morrison Formation material and Zuni wood, with smaller increases in splintery silicified wood and quartzite. Small-house sites show a more modest increase in Washington Pass chert and in yellow-brown spotted chert (an exotic material that does not increase in frequency at greathouses during this period), but not in splintery silicified wood or quartzite. From A.D. 1120 to 1220, greathouse sites show a slight decrease in the frequency of those exotics that were high from A.D. 1020 to 1120 (Washington Pass, Morrison Formation material, and Zuni wood), but an increase in two others (yellow-brown spotted chert and obsidian). The frequency of splintery silicified wood decreases markedly and the frequency of other local materials remains low.

Typological Variation

The chipped stone recovered from sites in Chaco Canyon is not the result of a highly developed technology. Formal tools are rare and even retouched flakes are infrequent. This pattern, common during the Pueblo period throughout the Southwest, makes functional interpretations difficult. Almost all of the chipped stone has been recovered from secondary deposits, which limits use of other provenience information in forming interpretations (Table 3.6). Expediently produced tools (utilized and retouched flakes) show little temporal patterning. Varying frequencies of these tools seem to correlate with type of material: more flakes of exotic materials showed use-wear than the more readily available local materials; however, the ability of the analyst to distinguish use-wear from non-functional types of edge damage must also be considered (for example, obsidian has very fragile edges).

Utilized and Unutilized Debitage

Table 3.16 lists ratios of utilized and retouched flakes to all flakes (utilized, retouched, and unutilized debitage combined) by material type and time. These ratios can be viewed as the percentage of all flakes which exhibit evidence for use in the form of wear patterns or retouch modification. Variation seems to be greater among material types than among periods. Generally, exotic materials show a much higher average ratio than do local materials. This is an indication either that exotic materials were more fully used than the more easily obtainable local materials or that exotic materials show use-wear more readily—the major exception is Zuni wood. Of the 254 flakes of Zuni wood, however, over 100 flakes were from a single small pit at Pueblo Alto dating from A.D. 1020 to 1120, almost certainly the result of a single chipping episode (Cameron 1985). These flakes were very small and almost none were used. Obsidian has consistently high ratios, possibly reflecting the brittleness of this material, which is easily damaged by any use and is most subject to post-depositional damage. The period from A.D. 920 to 1120 (especially A.D. 1020 to 1120), shows comparatively lower use ratios for all exotic materials. This coincides with the highest abundance of exotic material in the canyon. With larger quantities, these exotic materials seem to have been treated more like local materials in terms of frequency of informal use.

Local materials show some variation between specific material types. Splintery silicified wood has a uniformly low ratio which can be explained, in part, by the nature of the material which is poor quality. This material may not have been selected for types of use which would result in identifiable wear. The most common type of wear found on this material appears to be battering, the result of use as a hammerstone. Battering increases from A.D. 1020 to 1220, the period when this material is most frequent, and may indicate an increase in hammerstone use,

Table 3.15. Frequency of material for greathouse and small-house sites.

	A.D. 920-1020				A.D. 1020-1120				A.D. 1120-1220			
	Period 6				Period 7				Period 8			
	Greathouse		Small-house Sites		Greathouse		Small-house Sites		Greathouse		Small-house Sites	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	8	0.6	32	0.4	319	5.4	8	0.5	59	2.7	0	0
Yellow-brown chert	1	0.1	30	0.3	36	0.6	31	1.9	65	3.0	3	4.1
Washington Pass chert	95	6.8	117	1.3	1,525	26.0	64	3.9	424	19.3	5	6.8
Zuni wood	8	0.6	7	0.1	208	3.5	2	0.1	27	1.2	0	0
Obsidian	12	0.9	74	0.8	14	0.2	15	0.9	167	7.6	0	0
High surface cherts	127	9.2	749	8.5	269	4.6	166	10.0	212	9.6	12	16.2
Cherty silicified wood	284	20.5	3,049	34.8	585	10.0	664	40.0	315	14.3	7	9.5
Splintery silicified wood	40	2.9	695	7.9	1,196	20.4	124	7.5	189	8.6	3	4.1
Chalcedonic silicified wood	488	35.2	2,921	33.3	487	8.3	374	22.6	353	16.0	24	32.4
Quartzite	64	4.6	226	2.6	494	8.4	30	1.8	74	3.4	3	4.1
Other	260	18.7	868	9.9	728	12.4	180	10.9	317	14.4	17	23.0
Total	1,387		8,768		5,861		1,658		2,202		74	

Table 3.16. Ratio of utilized and retouched flakes to all debitage.[a]

	Period								
	2	3	4	5	6	7	8	12	
Material	A.D. 500s	A.D. 600s	A.D. 700-820	A.D. 820-920	A.D. 920-1020	A.D. 1020-1120	A.D. 1120-1220	A.D. 1220-1320	Average
Morrison Formation material	0.50	-	-	-	0.22	0.22	0.45	0.75	0.42
Yellow-brown spotted chert	0.36	-	0.42	-	0.36	0.25	0.29	0.27	0.32
Washington Pass chert	0.33	-	0.80	0.50	0.49	0.20	0.34	0.37	0.43
Zuni wood	-	-	-	-	0.13	0.11	0.23	-	0.16
Obsidian	0.56	0.69	0.73	0.75	0.83	0.68	0.70	0.50	0.68
High surface chert	0.25	0.25	0.20	0.12	0.20	0.18	0.19	0.18	0.20
Cherty silicified wood	0.30	0.45	0.32	0.28	0.31	0.29	0.19	0.40	0.32
Splintery silicified wood	0.09	0.04	0.05	-	0.08	0.16	0.19	0.14	0.11
Chalcedonic silicified wood	0.32	0.41	0.33	0.24	0.27	0.22	0.19	0.19	0.27
Quartzite	0.20	-	0.31	0.13	0.17	0.25	0.33	0.28	0.24
Other	0.29	0.27	0.40	0.26	0.22	0.22	0.30	0.25	0.27

[a] Debitage = Utilized flakes, retouched flakes, whole flakes, angular debris, and raw material.

very likely in masonry construction. Ratios for quartzite (although higher than splintery silicified wood) are also relatively low, which may also be the result of the poor quality of this material or the difficulty in seeing use-wear on coarse-grained material.

Cores

Cores have been defined as "...pieces of material which exhibit no bulb of percussion and two or more negative scars at least 2 cm long which originate from one or more facets or surfaces of the material" (Chapman and Schutt 1977:92). This definition was used in the present analysis. Bradley (personal communication, 1979) has characterized the Chaco Canyon technology as "expedient;" i.e., not formalized, and this assessment is generally reflected in the cores. Most cores show irregular, unpatterned flaking. There is no evidence of differential treatment of exotic materials. Temporal variation in material type generally reflects trends in other artifact types. Appendix 3C provides a detailed description of the variability present in the 613 cores identified in Chaco Canyon collections and the following section summarizes that information.

Material Selection

The proportions of materials in cores is generally similar to the proportion of materials in the entire collection (Table 3.17). There seems, however, to be proportionally more cores of cherty silicified wood and high surface chert and fewer cores of chalcedonic silicified wood than would be found in the general collection. This may be the result of the manner in which these two types of material occur. Chalcedonic silicified wood occurs in log form at some distance from the canyon. Processing large chunks of this material at its point of origin might result in the production of flakes (not cores), which would have been returned to the canyon. Cherty silicified wood, on the other hand, can be found in gravels in the Chaco area and local processing would probably form recognizable cores.

Splintery silicified wood had a very low frequency of cores in relation to its frequency in the rest of the collection. This may reflect reuse of cores of this material as hammerstones. The frequency of hammerstones of splintery silicified wood at sites in Chaco Canyon averages about 30 percent of all hammerstones and reaches over 50 percent at some sites.

Mass

Core weights in grams were used to monitor core mass or size, and were divided into six intervals (Table 3.18) for comparison with material types. Patterned variability clearly exists among these groups, but zero cells preclude the use of simple statistical evaluation. Exotic cores tend to exhibit very small masses (except for Morrison Formation material). Of the local materials, splintery silicified wood, quartzite, and others all tend to be larger in mass, but chalcedonic silicified wood shows a general tendency to have small cores. Materials were regrouped to eliminate zero cells (all exotics were combined as one group and splintery silicified wood, quartzite, and miscellaneous materials were combined); the resulting chi-square statistic was significant at the 0.01 level ($\chi^2=86.4$, df=20), indicating that cores of exotic materials are generally smaller than cores of local materials.

Cortex

Exotic cores show little cortex (Table 3.19) while local materials, especially high surface cherts, cherty silicified wood, and quartzite showed a high frequency of cortex. Chalcedonic silicified wood, like exotic material, has a low frequency of cortex. A chi-square of material grouped to eliminate zero-cells (all exotics combined, quartzite and other combined) by cortex was significant at the 0.01 level ($\chi^2=111.12$, df=20, P=0.0000).

Form

Core form was described through variables of maximum dimension, weight (as an estimate of mass), and core type (see Appendix 3C for definition of core types). Cores were overwhelmingly irregular. Some specific types seem to be related to material type (Table 3.20); wedge cores are almost exclusively silicified wood (primarily cherty silicified wood), obsidian has a greater than expected frequency of test cores, and quartzite has a higher than expected frequency of polyhedral and discoidal cores. To test this tendency, core type and material type distributions were examined (eliminating irregular cores). Test cores, wedge cores, and other cores were combined, and material type was

Table 3.17. Frequency and proportions of material for cores versus all other chipped stone.

	Cores		All Other Chipped Stone	
	No.	%	No.	%
Morrison Formation material	8	1.3	536	1.6
Yellow-brown spotted chert	6	1.0	366	1.1
Washington Pass chert	34	5.7	2,877	8.5
Zuni wood	10	1.7	297	0.9
Obsidian	9	1.5	660	2.0
High surface chert	113	18.9	3,648	10.8
Cherty silicified wood	195	32.6	7,922	23.5
Splintery silicified wood	5	0.8	3,310	9.8
Chalcedonic silicified wood	89	14.9	8,598	25.5
Quartzite	13	2.2	1,375	4.0
Other	116	19.4	4,139	12.2

regrouped to eliminate zero cells. The resulting chi-square was not significant at the 0.01 level (χ^2=16.8, df=8, P=.0322), indicating that, in general, specific core types were not related to specific material types.

Core types showed no regular variation in size as measured by weight and maximum dimension (Appendix 3C). There is less cortex on discoidal and polyhedral cores and more cortex on irregular, wedge test, and other cores (Appendix 3C). Discoidal and polyhedral cores are more prepared than other types and their lower frequency of cortex may simply reflect the greater number of flake scars that were removed in producing these types.

Temporal and Spatial Variability

As described in Appendix 3C, the variation in material type by period for cores is, in general, very similar to this variation in material type for all chipped stone. The most notable difference is the absence of cores of exotic material in early periods. The spatial distribution for cores also follows that for all chipped stone (Appendix 3C), with cores concentrated in pitstructure fill, trash mound fill, and miscellaneous features. These are also the locations of the highest frequencies of chipped stone. There is no apparent variability in the distribution of core type over time (Appendix 3C).

Summary

Material type for cores follows fairly closely the material proportions in the general chipped stone population. Cores are predominantly irregular. The presence of cortex on cores varies by material type; exotics and chalcedonic silicified wood show little cortex. In this and in core size, chalcedonic silicified wood resembles exotics. There is no evidence that cores of exotic material were technologically different than those of local material; they are simply smaller. This, like flake use, may reflect more complete utilization of exotic material.

Formal Tools

Formal tools included all items identified as facially flaked points, knives, or drills; all pieces with retouch covering more than one-third of the face; and all potential drill facets on retouched or utilized flakes (Lekson; Chapter 4 of this volume). Relatively few formal tools were recovered from sites

Table 3.18. Grouped material by grouped weight for cores.[a]

	Weight (gm)						
Material	0-10	10.1-20	20.1-30	30.1-40	40.1-50	50.1-60	Total
Morrison Formation material	0 0.0 0.0	2 25.0 1.7	1 12.5 0.7	1 12.5 1.2	0 0.0 0.0	4 50.0 2.4	8 1.3
Yellow-brown spotted chert	0 0.0 0.0	1 16.7 0.8	3 50.0 2.2	0 0.0 0.0	0 0.0 0.0	2 33.3 1.2	6 1.0
Washington Pass chert	4 11.8 10.0	11 32.4 9.1	10 29.4 7.2	3 8.8 3.5	1 2.9 1.6	5 14.7 3.0	34 5.6
Zuni wood	1 10.0 2.5	7 70.0 5.8	1 10.0 0.7	1 10.0 1.2	0 0.0 0.0	0 0.0 0.0	10 1.6
Obsidian	9 90.0 22.5	1 10.0 0.8	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	10 1.6
High surface chert	3 2.7 7.5	20 17.7 16.5	26 23.0 18.7	19 16.8 22.4	14 12.4 22.6	31 27.4 18.8	113 18.5
Cherty silicified wood	13 6.5 32.5	37 18.5 30.6	54 27.0 38.8	34 17.0 40.0	23 11.5 37.1	39 19.5 23.6	200 32.7
Splintery silicified wood	1 12.5 2.5	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	7 87.5 4.2	8 1.3
Chalcedonic silicified wood	5 5.5 12.5	24 26.4 19.8	21 23.1 15.1	12 13.2 14.1	9 9.9 14.5	20 22.0 12.1	91 14.9
Quartzite	0 0.0 0.0	0 0.0 0.0	3 23.1 2.2	1 7.7 1.2	4 30.8 6.5	5 38.5 3.0	13 2.1
Other	4 3.4 10.0	18 15.1 14.9	20 16.8 14.4	14 11.8 16.5	11 9.2 17.7	52 43.7 31.5	119 19.4
Total	40	121	139	85	62	165	612
Percent of Total	6.5	19.8	22.7	13.9	10.1	27.0	100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3.19. Material type by amount of cortex.[a]

Material	No Cortex	1-25%	25-50%	50-75%	75-100%	Total
Morrison Formation material	4	3	1	0	0	8
	50.0	37.5	12.5	0.0	0.0	
	2.5	1.3	0.8	0.0	0.0	1.3
Yellow-brown spotted chert	3	2	1	0	0	6
	50.0	33.3	16.7	0.0	0.0	
	1.9	0.9	0.8	0.0	0.0	1.0
Washington Pass chert	24	8	2	0	0	34
	70.6	23.5	5.9	0.0	0.0	
	14.8	3.5	1.5	0.0	0.0	5.5
Zuni wood	8	2	0	0	0	10
	80.0	20.0	0.0	0.0	0.0	
	4.9	0.9	0.0	0.0	0.0	1.6
Obsidian	2	1	2	3	2	10
	20.0	10.0	20.0	30.0	20.0	
	1.2	0.4	1.5	4.3	8.7	1.6
High surface chert	11	49	30	16	7	113
	9.7	43.4	26.5	14.2	6.2	
	6.8	21.7	22.7	22.9	30.4	18.4
Cherty silicified wood	45	83	44	26	3	201
	22.4	41.3	21.9	12.9	1.5	
	27.8	36.7	33.3	37.1	13.0	32.8
Splintery silicified wood	0	4	3	1	0	8
	0.0	50.0	37.5	12.5	0.0	
	0.0	1.8	2.3	1.4	0.0	1.3
Chalcedonic silicified wood	37	40	9	4	1	91
	40.7	44.0	9.9	4.4	1.1	
	22.8	17.7	6.8	5.7	4.3	14.8
Quartzite	1	4	3	2	3	13
	7.7	30.8	23.1	15.4	23.1	
	0.6	1.8	2.3	2.9	13.0	2.1
Others	27	30	37	18	7	119
	22.7	25.2	31.1	15.1	5.9	
	16.7	13.3	28.0	25.7	30.4	19.4
Total	162	226	132	70	23	613
Percent of Total	26.4	36.9	21.5	11.4	3.8	100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3.20. Cores: Material type by core type.[a]

	Type of Core						
Material	Irregular	Discoidal	Polyhedral	Test	Other	Wedge	Total
Morrison Formation material	7	1	0	0	0	0	8
	87.5	12.5	0.0	0.0	0.0	0.0	
	1.5	1.3	0.0	0.0	0.0	0.0	1.3
Yellow-brown spotted chert	5	1	0	0	0	0	6
	83.3	16.7	0.0	0.0	0.0	0.0	
	1.1	1.3	0.0	0.0	0.0	0.0	1.0
Washington Pass chert	26	7	1	0	0	0	34
	76.5	20.6	2.9	0.0	0.0	0.0	
	5.5	9.3	3.6	0.0	0.0	0.0	5.7
Zuni wood	6	2	1	0	0	1	10
	60.0	20.0	10.0	0.0	0.0	10.0	
	1.3	2.7	3.6	0.0	0.0	5.6	1.7
Obsidian	6	0	1	2	0	0.0	9
	66.7	0.0	11.1	22.2	0.0	0.0	
	1.3	0.0	3.6	33.3	0.0	0.0	1.5
High surface chert	97	11	4	1	0	0	113
	85.8	9.7	3.5	0.9	0.0	0.0	
	20.6	14.7	14.3	16.7	0.0	0.0	18.9
Cherty silicified wood	154	19	7	0	1	14	195
	79.0	9.7	3.6	0.0	0.5	7.2	
	32.8	25.3	25.0	0.0	100.0	77.8	32.6
Splintery silicified wood	4	0	0	0	0	1	5
	80.0	0.0	0.0	0.0	0.0	20.0	
	0.9	0.0	0.0	0.0	0.0	5.6	0.8
Chalcedonic silicified wood	74	12	1	0	0	2	89
	83.1	13.5	1.1	0.0	0.0	2.2	
	15.7	16.0	3.6	0.0	0.0	11.1	14.9
Quartzite	5	4	3	1	0	0	13
	38.5	30.8	23.1	7.7	0.0	0.0	
	1.1	5.3	10.7	16.7	0.0	0.0	2.2
Others	86	18	10	2	0	0	116
	74.1	15.5	8.6	1.7	0.0	0.0	
	18.3	24.0	35.7	33.3	0.0	0.0	19.4
Total	470	75	28	6	1	18	598
Percent of Total	78.6	12.5	4.7	1.0	0.2	3.0	100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3.21. Material frequency: Tools versus all chipped stone.

	Tools		All Chipped Stone (Tools removed)	
Material	No.	%	No.	%
Morrison Formation material	30	5.9	523	1.5
Yellow-brown spotted chert	2	0.4	339	1.0
Washington Pass chert	16	3.2	2,902	8.6
Zuni wood	2	0.4	302	0.9
Obsidian	92	18.3	587	1.7
High surface chert	103	20.5	3,669	10.8
Cherty silicified wood	65	12.9	8,065	23.8
Splintery silicified wood	2	0.4	3,312	9.8
Chalcedonic silicified wood	92	18.3	8,598	25.4
Quartzite	2	0.4	1,386	4.1
Other	96	19.1	4,191	12.4
	502	99.8	33,874	100.0

in Chaco Canyon (502 or 1.5 percent of the total chipped stone). This proportion of formal tools to debitage is not unusual in Anasazi sites.

Material Selection

Unlike cores, the grouped material distribution for tools is very different from the rest of the chipped stone assemblage (Table 3.21). The frequency of Washington Pass chert tools is lower than the rest of the assemblage, but the frequency of obsidian tools is much higher. The result is that exotics as a group are more frequent in tools than in bulk chipped stone. The high frequency of the "other" category in tools also indicates unusual material in formal tools.

Of the local materials, high surface chert makes up a larger proportion of tools than of the rest of the assemblage, while chalcedonic silicified wood is proportionally low. Combined frequencies of these two material types produce nearly identical proportions in both tools and bulk chipped stone (37 percent). As both material types are light-colored and chalcedonic, the inverse frequencies may be due to the difficulty in seeing woody structure in a retouched tool, leading to a more frequent identification of tools as high surface chert.

Due to a large "other" category, individual material types were examined. Table 3.22 gives the frequency and percentage of each material type for tools and for all chipped stone. (Only material types found in the tool collection are used, thus the percentages for all chipped stone do not add up to 100 percent.) Although most percentages are similar, there are several interesting differences. Morrison Formation tools are primarily types 1022 and 2205, while Morrison Formation debitage is primarily type 1040 (see Temporal Patterning). Type 2205 (a whitish quartzitic sandstone) seems to have been used for projectile point manufacture, a fact also noted in the La Plata area (Morris 1939:128). Lack of manufacture debris from this material may indicate that these tools were manufactured elsewhere and brought to Chaco Canyon. Laguna chert (material type 1430, Warren n.d.) is also limited primarily to finished tools, especially eight tools at site 29SJ 627 (Cameron 1981b). These could easily represent a single trading or procurement event. Tools make up about one-quarter of all pieces of material type 1014

Table 3.22. Frequency of ungrouped material types for tools compared with all chipped stone.

Material Type		Tools No.	Tools %	All Chipped Stone No.	All Chipped Stone %
1010	Miscellaneous fossiliferous chert	7	1.4	446	1.3
1011	Fossiliferous chert, San Juan County	1	0.2	140	0.4
1014	Varicolored fossiliferous chert	7	1.4	29	0.1
1022	Pastel-colored chert with quartz grains	5	1.0	3	0.0
1030	Miscellaneous black chert	4	0.8	35	0.1
1040	Chert and silicified clastic rocks of Morrison Formation	5	1.0	489	1.4
1042	Purplish-red or gray argillaceous chert or opal	2	0.4	8	0.0
1050	Miscellaneous white chert	21	4.2	378	1.1
1052	Clear translucent chalcedony	52	10.5	949	2.8
1053	Chalcedony with black inclusions	21	4.2	2,025	5.9
1054	Miscellaneous chalcedony and chert	9	1.8	247	0.7
1060	Miscellaneous dark red jasper	3	0.6	134	0.4
1070	Yellowish brown chert	7	1.4	139	0.4
1072	Yellow-brown chert (jasper with mossy black inclusions)	2	0.4	340	1.0
1080	Washington Pass chert	14	2.8	2,837	8.3
1081	Pink chalcedonic chert	2	0.4	58	0.2
1098	Chert chalcedonic, similar to 1091	1	0.2	-	-
1110	Dark brown to gray splintery wood	2	0.4	3,268	9.7
1112	Dark cherty wood (non-chalcedonic)	28	5.6	5,425	16.0
1113	Light-colored cherty wood	35	7.1	2,629	7.8
1120	Red-colored silicified wood	7	1.4	364	1.1
1140	Light-colored to white chalcedonic silicified wood	72	14.5	5,228	15.5
1141	Similar to 1140 with black inclusions	2	0.4	255	0.7
1142	Similar to 1140 with more streaks of color	11	2.2	1,764	5.2
1145	Similar to 1140, but dark colors	5	1.0	1,334	3.9
1150	Yellow-brown silicified (jasperized) wood	13	2.6	508	1.5
1160	Colored chalcedonic wood from Chinle Formation	1	0.2	297	0.1
1161	Cherty rather than chalcedonic variety of 1160	1	0.2	8	0.0
1200	Miscellaneous chalcedony with white inclusions	1	0.2	5	0.0
1201	Miscellaneous chalcedony with red inclusions	1	0.2	3	0.0
1210	Miscellaneous chalcedony with mossy (? black) inclusions	1	0.2	14	0.0
1214	Clear colorless or pink and flesh-colored chalcedony with milky-white inclusions, Zia and Jemez area	1	0.2	4	0.0

Table 3.22. (continued)

Material Type		Tools No.	Tools %	All Chipped Stone No.	All Chipped Stone %
1220	Colorless translucent chalcedony with scattered yellow mossy inclusions	1	0.2	17	0.0
1221	Colorless translucent chalcedony with abundant yellow mossy inclusions	1	0.2	46	0.1
1230	Colorless translucent chalcedony with sparse red inclusions	4	0.8	88	0.3
1231	Colorless translucent chalcedony with abundant red inclusions	4	0.8	25	0.1
1233	Colorless translucent chalcedony with abundant yellow and red inclusions	1	0.2	4	0.0
1235	Colorless translucent chalcedony with reddish-purple inclusions	1	0.2	4	0.0
1400	Chert, undifferentiated	1	0.2	144	0.4
1430	Chalcedony, Morrison Formation near Laguna	8	1.6	1	0.0
1600	Chert, light gray	5	1.0	57	0.2
1610	Chert, dark gray	2	0.4	32	0.1
1660	Chert, light tan to buff	1	0.2	37	0.1
2000	Sandstone, undifferentiated	2	0.4	263	0.8
2200	Miscellaneous, silicified quartzose sandstone	1	0.2	112	0.3
2202	Silicified fine-grained brown concretion	3	0.6	504	1.5
2205	Silicified fine-grained quartzose, sandstone	20	4.0	6	0.0
2221	Silicified fine-grained quartzose sandstone	1	0.2	77	0.2
3520	Obsidian, clear with brown tinges, Jemez Mountains	47	9.5	293	0.9
3523	Obsidian, near opaque with brown color on thin edges, Jemez Mountains	2	0.4	2	0.0
3530	Obsidian, smoky-gray with fine white inclusions, black dust, Polvadera Peak	13	2.6	33	0.1
3540	Obsidian, Mule Creek	3	0.6	5	0.0
3550	Obsidian	19	3.8	123	0.4
3560		1	0.2	3	0.0
3601	Obsidian, San Francisco field, AZ	2	0.4	23	0.1
3603	Obsidian	3	0.6	18	0.1
3604	Obsidian	1	0.2	2	0.0
3700	Vitrophyre, black, dense	3	0.6	1	0.0
4000	Quartzite, undifferentiated	2	0.4	859	2.5

(a dark, fossiliferous chert) which is found in an unusually high frequency. From Judd's (1954) description, it would seem that two large, beautifully shaped blades recovered from Pueblo Bonito were also made of this material. Judd suggested that this material type was exotic to the Chaco area; however, recent evidence (Appendix 3A) suggests it may be local.

Formal Patterning

The distribution of tool types by material type is shown in Table 3.23. Tools are grouped in six subsets: 1) arrow points, 2) large point/knives, 3) miscellaneous points and blade fragments, 4) drills, 5) scrapers, and 6) others. There is apparent patterning in the selection of materials for specific types of tools. Arrow points and large point/knives have the highest frequencies of exotic materials; one-quarter of both these types are obsidian and many are "other" material. Arrow points, miscellaneous points, and blade fragments are frequently high surface chert. Few drills and no scrapers were made of exotic material. Almost half of all drills are chalcedonic silicified wood, including all of types 236 (micro drills) and 237 (micro-fortuitous perforators). The association of chalcedonic silicified wood with jewelry-making is discussed below (see Special Topics).

A chi-square test of the relationship between tools of exotic and local materials (four tool groups: arrow points, large point/knives, miscellaneous points and blade fragments, and drills against two material groups, local and exotic) was significant at the 0.01 level ($\chi^2=42.4$, df=3, P=0.000).

Temporal Patterning

Table 3.24 shows the distribution of material type by time period for formal tools. The bottom of this table shows the proportion that formal tools represent of the entire chipped stone assemblage in each period. Tools are proportionately more frequent in the chipped stone assemblages in the early periods (A.D. 500s and 600s) and considerably less frequent in later periods. This may result from collection techniques (especially screening) employed in the excavation of the earliest sites (Table 3.6)

The frequencies of tools by material type in these periods is low; comparison of percentages may be suspect. It is clear, however, that tool materials generally do not resemble non-tool, chipped stone, material types. Certain tools were evidently imported in a finished state. Arrow points are frequently exotic material, which occurs during periods when debitage of the same exotic type is sparse. The same, in general, is true of large point/knives and miscellaneous point and blade fragments. Only Washington Pass chert tools have peak frequencies in the same period as Washington Pass chert bulk material (compare Table 3.24 and Table 3.9). Obsidian tools are proportionately more frequent from A.D. 600 to A.D. 820 and again from A.D. 920 to 1020, but decrease from A.D. 1120 to 1220 when much obsidian is found in Chaco in unfinished form. Of local materials, only chalcedonic silicified wood reflects the pattern for the majority of the chipped stone assemblage.

Drills and scrapers are generally comprised of local material, primarily chalcedonic silicified wood. This material shows roughly the same temporal distribution for tools as for debitage. These two simple tool types were probably expediently produced and used at the sites.

<u>Formal Distribution</u>. The temporal distribution of tool forms (Table 3.25) groups types in a slightly different fashion. Arrow points and arrow point blade fragments are divided into stemmed, corner-notched, and side-notched groups. These three groups are commonly used in Anasazi archeology and have been shown to have temporal implications. Drills are separated as follows: formal drills, large drills, and micro drills. Large point/knives, miscellaneous point/blades and scrapers remain in the same groupings.

Arrow points show a shift in time from stemmed to corner-notched to side-notched, typical of the Anasazi area (Hayes and Lancaster 1975:144-145; Lekson, Chapter 4 of this volume; Morris 1939:127; Woodbury 1954). Large point/knives seem to be continuously distributed through time (although this is not well-reflected in the percentage of type for subtotal of types), but miscellaneous points and blades are heavily concentrated in the A. D. 500s. (This period includes almost half of the miscellaneous unclassified tools.) Material from this period is dominated by site 29SJ 423 (Table 3.6). Almost half of the tools from this site were classified as "unfinished" (Lekson, Chapter 4 of this volume). In

Table 3.23. Material type variation for tools.

	Arrow Points															
	Stemmed 202		Corner-notched 203		Side-notched 204		Stemmed/blade fragment 205		Corner-notched/blade fragment 206		Side-notched/blade fragment 207		Large corner-notched 215		Renotched side-notched 218	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	1	2.9	5	6.2	11	17.5	-	-	2	5.0	4	15.4	-	-	-	-
Yellow-brown spotted chert	-	-	2	2.5	-	-	-	-	-	-	-	-	-	-	-	-
Washington Pass chert	1	2.9	5	6.2	1	1.6	1	14.3	2	5.0	1	3.8	-	-	-	-
Zuni wood	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Obsidian	10	29.4	18	22.2	7	11.1	2	28.6	13	32.5	9	34.6	-	-	4	66.7
High surface chert	7	20.6	21	25.9	18	28.6	2	28.6	9	22.5	4	15.4	-	-	2	33.3
Cherty silicified wood	2	5.9	2	2.5	5	7.9	-	-	1	2.5	1	3.8	1	33.3	-	-
Splintery silicified wood	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chalcedonic silicified wood	9	26.5	4	4.9	7	11.1	2	28.6	3	7.5	1	3.8	1	33.3	-	-
Quartzite	-	-	1	1.2	-	-	-	-	-	-	-	-	-	-	-	-
Other	4	11.8	23	28.4	14	22.2	-	-	10	25.0	6	23.1	1	33.3	-	-
Total	34		81		63		7		40		26		3		6	

Type total 260

Table 3.23. (continued)

	Large Point/Knife									
	Large-shouldered 208		Large corner-notched 215		Large side-notched 219		Knife 221		Saw (and denticulates) 223	
Material	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	1	16.7	1	9.1	1	25.0	-	-	-	-
Yellow-brown spotted chert	-	-	-	-	-	-	-	-	-	-
Washington Pass chert	-	-	-	-	-	-	1	11.1	-	-
Zuni wood	-	-	-	-	-	-	1	11.1	-	-
Obsidian	1	16.7	4	36.4	1	25.0	1	11.1	1	100.0
High surface chert	1	16.7	-	-	1	25.0	-	-	-	-
Cherty silicified wood	1	16.7	4	36.4	-	-	1	11.1	-	-
Splintery silicified wood	-	-	-	-	-	-	1	11.1	-	-
Chalcedonic silicified wood	-	-	-	-	-	-	1	11.1	-	-
Quartzite	-	-	-	-	-	-	-	-	-	-
Other	2	33.3	2	18.2	1	25.0	3	33.3	-	-
Total	6		11		4		9		1	

Type Total 31

Table 3.23. (continued)

	Miscellaneous Point/Blade											
	Miscellaneous blade fragment 209		Large non-hafted blade 210		Small non-hafted blade 213		Asymmetrically waisted 214		Contracting base 220		Symmetrically waisted point 239	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	3	6.0	-	-	-	-	-	-	1	33.3	-	-
Yellow-brown spotted chert	-	-	-	-	-	-	-	-	-	-	-	-
Washington Pass chert	-	-	1	11.1	1	2.9	-	-	-	-	-	-
Zuni wood	-	-	-	-	-	-	-	-	-	-	-	-
Obsidian	6	12.0	2	22.2	6	17.6	-	-	1	33.3	-	-
High surface chert	12	24.0	3	33.3	8	23.5	1	20.0	1	33.3	1	100.0
Cherty silicified wood	7	14.0	2	22.2	5	14.7	2	40.0	-	-	-	-
Splintery silicified wood	-	-	-	-	-	-	-	-	-	-	-	-
Chalcedonic silicified wood	8	16.0	-	-	11	32.4	1	20.0	-	-	-	-
Quartzite	-	-	-	-	-	-	-	-	-	-	-	-
Other	14	28.0	1	11.1	3	8.8	1	20.0	-	-	-	-
Total	50		9		34		5		3		1	

Type Total 102

Table 3.23. (continued)

	Drills											
	Formal drill 231		Gouge, chisel 233		Fortuitous perforator 234		Projection on blade 235		Micro drill 236		Micro fortuitous perforator 237	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	-	-	-	-	-	-	-	-	-	-	-	-
Yellow-brown spotted chert	-	-	-	-	-	-	-	-	-	-	-	-
Washington Pass chert	-	-	-	-	-	-	-	-	-	-	-	-
Zuni wood	-	-	1	100.0	-	-	-	-	-	-	-	-
Obsidian	1	4.5	-	-	-	-	1	7.1	-	-	-	-
High surface chert	5	22.7	-	-	3	9.7	3	21.4	-	-	-	-
Cherty silicified wood	5	22.7	-	-	10	32.3	6	42.9	-	-	-	-
Splintery silicified wood	-	-	-	-	1	3.2	-	-	-	-	-	-
Chalcedonic silicified wood	7	31.8	-	-	16	51.6	2	14.3	3	100.0	10	100.0
Quartzite	-	-	-	-	-	-	-	-	-	-	-	-
Other	4	18.2	-	-	1	3.2	2	14.3	-	-	-	-
Total	22		1		31		14		3		10	

Type Total 81

Table 3.23. (continued)

	Scrapers				Others					
	Side 211		End 212		Piece esquille 238		Miscellaneous unclassified tool 217		Total	
Material	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	-	-	-	-	-	-	-	-	30	6.0
Yellow-brown spotted chert	-	-	-	-	-	-	-	-	2	0.4
Washington Pass chert	-	-	-	-	1	11.1	-	-	16	3.2
Zuni wood	-	-	-	-	-	-	1	10.0	2	0.4
Obsidian	-	-	-	-	-	-	4	40.0	92	18.3
High surface chert	-	-	-	-	-	-	1	10.0	103	20.5
Cherty silicified wood	1	25.0	2	40.0	4	44.4	3	30.0	65	12.9
Splintery silicified wood	-	-	-	-	-	-	-	-	2	0.4
Chalcedonic silicified wood	3	75.0	-	-	3	33.3	-	-	92	18.3
Quartzite	-	-	1	20.0	-	-	-	-	2	0.4
Other	-	-	2	40.0	1	11.1	1	10.0	96	19.1
Total	4		5		9		10		502	
	Type Total		9		|		19			

Table 3.24. *Material by time for formal tools.*

	Period																	
	2 A.D. 500s		3 A.D. 600s		4 A.D. 700-820		5 A.D. 820-920		6 A.D. 920-1020		7 A.D. 1020-1120		8 A.D. 1120-1220		12 A.D. 1220-1320		Total	
Material	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Morrison Formation material	-	-	2	5.9	1	5.3	-	-	5	3.6	8	12.9	8	19.5	-	-	24	6.3
Yellow-brown spotted chert	-	-	-	-	-	-	-	-	1	0.7	-	-	-	-	-	-	1	0.3
Washington Pass chert	2	2.7	2	5.9	1	5.3	-	-	3	2.2	4	6.5	2	4.9	1	14.3	15	3.9
Zuni wood	1	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0.3
Obsidian	6	8.0	11	32.4	5	26.3	3	37.5	33	23.9	8	12.9	2	4.9	2	28.6	70	18.2
High surface chert	24	32.0	3	8.8	3	15.8	-	-	25	18.1	15	24.2	10	24.4	1	14.3	81	21.1
Cherty silicified wood	12	16.0	5	14.7	-	-	3	37.5	13	9.4	8	12.9	5	12.2	2	28.6	48	12.5
Splintery silicified wood	-	-	-	-	-	-	-	-	1	0.7	1	1.6	-	-	-	-	2	0.5
Chalcedonic silicified wood	21	28.0	7	20.6	5	26.3	2	25.0	35	25.4	6	9.7	2	4.9	-	-	78	20.3
Quartzite	-	-	1	2.9	-	-	-	-	1	0.7	-	-	-	-	-	-	2	0.5
Other	9	12.0	3	8.8	4	2.1	-	-	21	15.2	12	19.4	12	29.3	1	14.3	62	16.1
Total	75	19.5	34	8.9	19	4.9	8	2.1	138	35.9	62	16.1	41	10.7	7	1.8	384	
Percent of tools as a proportion of all	2,821	2.6	288	11.8	1,326	1.4	684	1.2	10,158	1.4	7,519	0.8	2,276	1.8	450	1.6		

Table 3.25. Distribution of tool types through time.

Tool	Period 2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D.920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320	Total
Stemmed points	16 21.3% (84.2%)	9 26.5% (50.0%)	1 5.3% (16.6%)	1 12.5% (50.0%)	6 4.3% (8.1%)	2 3.2% (4.9%)	- - -	- - -	35 - -
Corner-notched points	2 2.7% (10.5%)	7 20.5% (38.9%)	5 26.3% (83.3%)	1 12.5% (50.0%)	50 36.2% (67.6%)	16 25.8% (39.0%)	8 31.2% (25.8%)	2 28.6% (100.0%)	91 - -
Side-notched points	1 1.3% (5.6%)	2 5.8% (11.1%)	- - -	- - -	18 13.0% (24.3%)	23 37.1% (56.1%)	23 56.1% (74.2%)	- - -	67 - -
Sub-total Stemmed-corner-side points/blades	19	18	6	2	74	41	31	2	-
Large points and knives	1 1.3% (2.3%)	2 5.9% (16.7%)	3 15.8% (42.8%)	1 12.5% (100.0%)	4 2.9% (17.3%)	4 6.5% (50.0%)	- - -	2 28.5% (100.0%)	17
Miscellaneous points and blades	41 54.7% (95.3%)	9 26.5% (75.0%)	4 21.0% (57.1%)	- - -	15 10.8% (65.2%)	4 6.5% (50.0%)	6 14.6% (100.0%)	- - -	79 - -
Scrapers	1 1.3% (2.3%)	1 2.9% (8.3%)	- - -	- - -	4 2.9% (17.3%)	- - -	- - -	- - -	6
Sub-total Large points/knives, miscellaneous points, scrapers	43	12	7	1	23	8	6	2	102

Table 3.25. (continued)

	Period								
Tool	2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D.920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320	Total
Formal drill	4 5.3% (66.6%)	1 2.9% (100.0%)	4 21.1 (80.0%)	1 12.5% (25.0%)	2 1.4% (5.5%)	1 1.6% (16.7%)	2 4.9% (66.6%)	- - -	15
Gouge chisel	- - -	- - -	- - -	- - -	- - -	1 1.6% (16.7%)	- - -	- - -	1
Fortuitous perforators Projection on flake	2 2.6% (33.3%)	- - -	1 5.3% (20.0%)	3 37.5% (75.0%)	21 15.2% (58.3%)	4 6.4% (66.6%)	1 2.4% (33.3%)	1 14.3% (100.0%)	33
Micro drills Micro fortuitous Perforators	- - -	- - -	- - -	- - -	13 9.4% (36.1%)	- - -	- - -	- - -	13
Sub-Total Drills	6	1	5	4	36	6	3	1	62 - -
Totals All tools	75 19.5%	34 8.9%	19 4.9%	8 2.1%	138 35.9%	62 16.1%	41 10.7%	7 1.8%	384 -

Cells are presented as follows:
Count,
% type for time period,
(% type for sub-total of type).

this case, high frequencies of miscellaneous unclassified tools may indicate the remains of a workshop area. (Cameron [1979] discusses this site in further detail.)

Formal drills, like large point/knives occur across all periods. Other types of drills, however, are found mainly from A.D. 920 to 1020 and micro drills are found exclusively in this period. Proveniences at sites 29SJ 629 and 29SJ 389 have produced evidence of bead manufacturing activities (Mathien 1981), including micro drills. Expedient drills found in this period are probably part of the bead manufacturing process. Scrapers show a possible concentration from A.D. 920 to 1020, but the total frequency of this tool type is very low.

Spatial Distribution

In general, tools like debitage and other artifact types tend to occur most frequently in trash, either in pitstructure trash fill or in trash mounds (Table 3.26). The relative frequency of formal tools to debitage varied significantly among provenience types, however. A relative frequency of tools to all chipped stone was calculated for each provenience type (Table 3.26). The percentage of tools to all chipped stone was highest in storage room floors, pitstructure floors, and site surface and it was lowest in trash mound fill and plaza/ramada surfaces. Tools are more likely to remain in primary context proveniences (perhaps the location of use or storage) and chipping debris is more likely to have been discarded. Formal tools are obviously more likely to be observed in surface collections, thus the high value for site surface.

Table 3.27 groups space into five categories: fill, floor, trash and trash fill, site surface, and miscellaneous. Only four formal tool groups are used here (projectile points, large point/knives, miscellaneous blades, and drills). These four tool groups distribute significantly among spatial units ($\chi^2=45.17$, df=12, P=0.000). Drills were found most frequently in trash fill, but very infrequently on floors. Large point/knives are also frequent in trash, but absent from site surface, perhaps a function of earlier surface collections. They have a slightly higher than expected frequency on floors. Points are found with greater than expected frequency in non-trash fill and on floors.

Some of this variability can be explained. The high frequency of points (and other tools) in non-trash fill is, in part, the result of the inclusion of roof-fall material in room fill. Roof-fall material was separated from other fill at Pueblo Alto. At least 40 percent of the tools in fill came from deposits specified as roof-fall and it is likely that many other tools from general fill and rubble also originated on the roof. All of these roof-fall tools were either projectile points or miscellaneous blade fragments. Thus, many of these tools may reflect activities on roofs rather than discard in trash.

The high frequency of drills in trash may be explained by the expedient nature of these tools, many of which are minimally retouched flakes. As such, they were more likely to be discarded after use rather than curated as a more formal tool might be.

Primary context deposits might be expected to contain whole tools, while secondary deposits would contain fragmentary tools. Ratios of the percentages of whole and fragmentary tools (calculated using Lekson's "Condition" variable [Chapter 4 of this volume]) show this to be true (Table 3.28). Storage room floors, pitstructure floors, and plaza surfaces all produced high ratios of whole tools to fragmentary tools. Surprisingly, ramada/living room floors did not show this high ratio, nor did roof-fall material at Pueblo Alto.

Greathouse versus Small-house Sites

Table 3.29 compares the distribution of tool type to all chipped stone for greathouse and small-house sites. The most striking fact here is that while the percentage of the total assemblage represented by tools is not remarkable for either greathouse or small-house sites, small-house sites have far fewer flakes per tool than do greathouses (55 as compared with 104). Tools in greathouse contexts are almost all points with few other tool types represented. Tools in small-house sites are much more varied. Most scrapers and all miscellaneous and unclassified tools (including wedges) are found in small-house sites.

The small-house sites were excavated early in the project and many of the deposits at these sites were not screened, resulting in a disproportionate number of tools compared to flakes. Sites 29SJ 629 and 29SJ 627 were selected as small-house sites that

Table 3.26. Distribution of tools in space compared to all chipped stone.

	All Tools		All Chipped Stone		
Provenience	No.	%	No.	%	Percent of Tools to All Chipped Stone
Ramada/living room fill	17	3.4	847	2.5	2.01
Ramada/living room floor	9	1.8	774	2.3	1.16
Storage room fill	28	5.6	1,365	4.0	2.05
Storage room floor	13	2.6	216	0.6	6.01
Room trash fill	31	6.3	1,284	3.7	2.41
Pitstructure trash fill	115	23.2	7,582	22.1	1.52
Pitstructure other fill	23	4.6	2,017	5.9	1.14
Pitstructure floors	25	5.0	759	2.2	3.29
Plaza/ramada fill	38	7.7	2,559	7.5	1.48
Plaza/ramada surfaces	3	0.6	346	1.0	0.87
Trash mound fill	91	18.3	11,069	32.3	0.82
Site feature fill/floor	-	-	50	0.1	
Site surface	51	10.3	1,553	4.5	3.28
Miscellaneous/other	52	10.5	3,825	11.2	1.36
Totals	496		34,246		

had been screened. The number of flakes per tool for 29SJ 629 (Table 3.30) was very similar to that for greathouse sites (also screened) (94 flakes per tool), which might indicate that variability in flake/tool ratios are a result of biased field techniques.

The difference in formal tool type frequencies in greathouse and small-house assemblages, however, remains. Forty-seven percent of the tools at 29SJ 629 were arrow points, while greathouse sites had 76 percent arrow points. Because 29SJ 629 has been cited as a possible bead production area, the tool assemblage here may be unusual. The only other small-house site that was screened was 29SJ 627, but only during the second of two years of excavation. This screened material showed a flake per tool ratio of 76, a figure intermediate between total greathouse and small-house sites ratios (Table 3.30). Again, the artifact type frequencies are most similar to other small-house sites (a large variety of tools present) rather than greathouses.

Tool assemblages from small-house sites are more varied than those from greathouses. Greathouses appear to have supported a limited set of activities, while small-house sites were the locus of a wider range of activities. Most of the greathouse material, however, was recovered from one site, Pueblo Alto.

Summary

Material type variability indicates that formal tools, especially points and large point/knives were frequently imported in a finished state. Drills and scrapers, on the other hand, tended to be locally and expediently made. This evidence was supported by the fact that, in many cases, temporal distributions of debitage did not co-vary with tools of that same material type. Formal tools were found more often in primary context deposits rather than in trash and the tools in these contexts tended to be whole rather than fragmentary. Finally, points were the most frequent tool type found in greathouses, while a number of other tool types were found in small-house sites. It is unclear whether chipped stone

Table 3.27. Formal tools: Grouped artifact type (1-4) by space.

	Artifact Type									
	Points		Large Point/Knife		Misc. Point/Blade		Drill		Totals	
	No.	%	No.	%	No.	%	No.	%	No.	%
Fill	73	28.2	4	13.3	13	12.9	13	16.3	103	21.9
Floor	34	13.1	4	13.3	8	7.9	2	2.5	48	10.2
Trash	112	43.2	17	56.7	47	46.5	48	60.0	224	47.7
Surface	28	10.8	-	-	14	13.9	6	7.5	48	10.2
Miscellaneous	12	4.6	5	16.7	19	18.8	11	13.6	47	10.0
Totals	259	55.1	30	6.4	101	21.5	80	17.0	470	100.0

% = row percent.

Table 3.28. Ratio of whole tools to fragmentary tools by space.

Space	Whole Tools	Fragmented Tools	Ratio
Ramada/living room fill	14	11	1.3
Ramada/living room floor	2	5	0.4
Storage room fill	11	11	1.0
Storage room floor	11	3	3.7 <
Room trash fill	9	14	0.6
Pitstructure trash fill	61	66	0.9
Pitstructure other fill	14	10	1.4
Pitstructure floors	17	7	2.4 <
Plaza/ramada fill	16	24	0.7
Plaza/ramada surfaces	2	1	2.0 <
Trash mound fill	50	45	1.1
Site feature fill/floor	-	-	-
Site surface	27	37	0.7
Miscellaneous	23	30	0.8

< = high ratios.

Table 3.29. Formal tools: Greathouse and small-house sites.

	Greathouse		Small-house		Total	
Artifact Type	No.	%	No.	%	No.	%
Points	69	75.8	133	45.4	202	52.6
Large point/knife	3	3.3	14	4.8	17	4.4
Miscellaneous point/blade	11	12.1	68	23.2	79	20.6
Drill	8	8.8	54	18.4	62	16.1
Scrapers	-		6	2.0	6	1.6
Miscellaneous unclassified tool	-		10	3.4	10	2.6
Wedge	-		8	2.7	8	2.1
Total tools	91		293		384	
All chipped stone	9,450		16,063			
Ratio: Flakes to Tools	104:1		55:1			

Table 3.30. Formal tools in screened deposits: Sites 29SJ 627 and 29SJ 629

	29SJ 629		29SJ 7627[a]	
Artifact Type	No.	%	No.	%
Points	34	47.2	31	43.1
Large point/knife	4	5.6	4	5.6
Miscellaneous point/blade	8	11.1	12	16.7
Drill	23	31.9	22	30.6
Scrapers	-		-	
Miscellaneous unclassified tools	2	2.8	1	1.4
Wedge	1	1.4	2	2.8
Total tools	72		72	
All chipped stone	7,025		5,988	
Ratio: Flakes toTools	93.6:1		75.8:1	

[a] Material only from the 1975 season when deposits were screened.

manufacturing (or expedient production of usable flakes) occurred more often at greathouses, or if flake to tool ratios were a product of variable excavation techniques.

Assemblages

Introduction

Because we anticipated a grand synthesis of all Chaco Project excavations, we attempted to construct chipped stone assemblage groups that could be used in comparisons with other artifact types. The following section examines variation within and between cells of the time-space matrix (Table 3.7). The individual cells within the time-space matrix are designated by a four-digit code combining the two dimensions of the table (i.e., storage room fill from A.D. 920 to 1020 would be 0306). Proveniences are the result of grouping all the chipped stone from a particular site in any one cell. There may be several sites and thus several proveniences within a single cell. Assemblages are empirically similar groups of proveniences within cells. In this section, again, eight temporal intervals of 100 years were used and only proveniences with a frequency of 50 or more items were included. This resulted in a sample of 24,429 pieces, or 71.2 percent of the total chipped stone assemblage (Table 3.31).

Material Type Assemblages

The chi-square statistic was calculated for 15 cells, which contained two or more proveniences (Table 3.32). In each case, exotic material types were combined and artifact types collapsed into two groups: 1) formal tools, utilized and retouched flakes (types 200 through 242), and 2) whole flakes, angular debris, cores, and raw material (types 243 through 770). Despite these combinations, in many chi-square tests, the expected value in one or more cells was less than five. The purpose of calculating the chi-square statistic was to determine which proveniences were empirically similar in either material type or artifact type and group these similar proveniences into assemblages. Proveniences that are significantly different are not combined. In some instances, significant chi-squares were the result of differences in field or laboratory technique (see Introduction, Sites/Sampling Biases). But the major source of variability between cells is between the greathouse sites (Una Vida, Pueblo Alto, and Pueblo del Arroyo) and the small-house sites. The following paragraphs examine each of these 15 cells in detail. Proveniences are combined into assemblages on the basis of significant chi-squares. Table 3.32 shows successive chi-squares as proveniences that are either combined or separated.

Table 3.31. Sites contributing proveniences to cells where more than 50 items were accumulated within each cell.[a]

	Period							
Space	2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7/18 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill	-	-	-	-	627	389	389	633
2 Ramada/living room floor	-	-	-	-	627	389/627	-	
3 Storage room fill	-	-	-	-	389/627/629	389/627	-	633
4 Storage room floor	-	-	-	-	389	-	-	
5 Room trash fill	-	-	-	-	391/627/629	627	-	633
6 Pitstructure trash fill	423	1659	724	627	389/627 629/1360	389/627	389	-
7 Pitstructure other fill	423	299	724	-	629/1360	389/627	-	-
8 Pitstructure floors	423	-	724	627	629/1360	-	-	-
9 Plaza/ramada fill	-	-	-	-	389/629 1360	389/627	389	-
10 Plaza/ramada surfaces	-	-	-	-	-	-	-	-
11 Trash mound fill	423	-	724/1360	629	627/626/629	389/627	-	-
12 Site feature fill/floor	-	-	-	-	627	-	-	-
13 Site surface	423	1659	724	-	629	-	-	-
14 Miscellaneous	423	-	-	-	389/627/629 1360	389	-	-

[a] Numbers in columns refer to site designations, e.g. 29SJ 627.

Table 3.32. Summary of Chi-square statistics for proveniences.[a]

		Material			Artifact		
[b]Time-Space Unit	Proveniences	χ^2	Df	P	χ^2	Df	P
0411	724 1360	5.09	5	0.4044	22.09	1	0.0000
0603	389/627/629	147.76	10	0.0000	23.53	2	0.0000
0603	627/629	16.04	5	0.0067	0.66	1	0.4174
0605	391/627/629	40.17	10	0.0000	5.36	2	0.0685
0605	627/629	8.46	5	0.1326	-	-	-
0606	389/624/621 1360	89.42	15	0.0000	56.13	3	0.0000
0606	389/629	8.25	5	0.1429	-		
0606	627/1360	5.37	5	0.3722	-	-	-
0606	627/629	-	-	-	0.49	1	0.4862
0606	389/1360	-	-	-	54.37	1	0.0000
0607	629/1360	11.27	5	0.0462	2.41	1	0.1207
0608	629/1360	18.42	5	0.0025	5.43	1	0.0198
0608	629/1360	17.04	4	0.0019	-	-	-
			w/material regrouped				
0609	389/629 1360	99.13	10	0.0000	39.58	2	0.0000
0609	629/1360	5.06	5	0.4091	9.78	1	0.0018
0611	626/627/629	69.36	10	0.0000	33.85	4	0.0000
0611	626/629	-	-	-	0.045	1	0.8324
0614	389/627/629 1360	342.50	15	0.0000	79.60	3	0.0000
0614	627/629	41.99	5	0.0000	0.0575	1	0.8104
0702	389/627	202.63	5	0.0000	1.19	1	0.2753
0703	389/627	34.52	5	0.0000	15.08	1	0.0001
0706	389/627	141.09	5	0.0000	4.31	1	0.0379
0707	389/627	16.44	5	0.0057	5.31	1	0.0212
0709	389/627	16.73	5	0.0050	8.73	1	0.0031
0711	389/627	779.75	5	0.0000	72.45	1	0.0000

[a] Table shows successive Chi-square as proveniences are combined or eliminated.
[b] See Table 3.7 for time-space codes.

Trash mound proveniences from sites 29SJ 724 and 29SJ 1360, dating A.D. 700 to 820 (Cell 0411), showed no significant variability in material so these two proveniences were combined into one assemblage. Storage room fill proveniences from sites 29SJ 389, 29SJ 627, and 29SJ 629, dating A.D. 920 to 1020 (Cell 0603), showed significant variability among the three proveniences. After eliminating 29SJ 389, however, the variation was not significant. Storage room fill at site 29SJ 389 has a very high frequency of "other" material, mainly in tool type "raw material" (see Artifact Type Assemblages). Recovery of these materials (as raw material) may not have been consistent at other sites or even at other portions of 29SJ 389; however, the excavators of other areas of 29SJ 389 and other sites indicated that this type of material was probably limited to these proveniences (Gillespie, Windes, Truell, personal communication). Although a significant chi-square resulted from a comparison of the 29SJ 627 and 29SJ 629 proveniences, inspection indicated similarities. Thus, storage room fill during this period was divided into two material assemblages; those found at greathouse sites (29SJ 389) and those found at small-house sites (29SJ 627 and 29SJ 629), with greathouse assemblages showing high frequencies of unworked rock of "other" type.

Room trash fill from A.D. 920 to 1020 (Cell 0605), with three proveniences (29SJ 391, 29SJ 627, 29SJ 629), showed significant variability in material type. After eliminating the greathouse (Una Vida), however, the variability between the other two proveniences was not significant. Una Vida has large quantities of chalcedonic silicified wood, a material often associated with special activity areas, such as turquoise-working or bead-making (see below). Room trash fill from this cell was divided into two material assemblages (greathouse [29SJ 391] and small-house sites [29SJ 629+29SJ 627]).

Pitstructure trash fill (Cell 0606) included four proveniences and the chi-square statistic with all four was significant. These four proveniences seemed to form two groups: 1) 29SJ 389 and 29SJ 629, and 2) 29SJ 627 and 29SJ 1360. The chi-square was recalculated for these two groups. Neither showed significant variability, so pitstructure trash fill was divided into two assemblages based on these two types.

Pitstructure, other fill, from A.D. 920 to 1020 (Cell 0607), showed no significant variation between the two proveniences included here, so they were combined into one material assemblage.

The two proveniences in pitstructure floors, 29SJ 629 and 29SJ 1360, dating from A.D. 920 to 1020 (Cell 0608), were significantly different; however, overall frequency was low at one site (29SJ 629). The chi-square was recalculated combining exotic materials and splintery silicified wood. The chi-square, again, was not highly significant; however, inspection showed these two proveniences to be similar so they were combined as one assemblage.

The three proveniences (two small-house sites and one greathouse) of plaza/ramada fill from A.D. 920 to 1020 (Cell 0609) were significantly different. The chi-square recalculated for only sites 29SJ 629 and 29SJ 1360 (two small-house sites) was not significant. Both small-house sites (unlike the greathouse) showed high frequencies of chalcedonic silicified wood. The greathouse site (29SJ 389) formed one assemblage and the small-house sites (29SJ 629 and 29SJ 1360) were combined into another assemblage.

The three proveniences of trash mound fill, A.D. 920 to 1020 (Cell 0611), were significantly different. Chi-squares were calculated using the possible combinations of proveniences and all showed significant variation (these chi-squares are not included in Table 3.32). Major differences seemed to be the higher quantity of exotics at site 29SJ 627 and the very high frequency of cherty silicified wood at site 29SJ 626. Each of these sites was defined as a separate assemblage.

Miscellaneous proveniences, A.D. 920 to 1020 (Cell 0614), contained four proveniences which differed significantly. Site 29SJ 389 (Pueblo Alto) contained very high frequencies of exotics and chalcedonic silicified wood; site 29SJ 1360 contained a high frequency of cherty silicified wood. The difference between 29SJ 627 and 29SJ 629 were mainly in the frequencies of exotic material. A chi-square of sites 29SJ 627 and 29SJ 629 showed significant differences between them. All four of these proveniences were considered separate assemblages for material type.

The remainder of the time-space proveniences under discussion are all A.D. 1020 to 1120 (Time Period 7) and each unit contains proveniences from the same two sites, 29SJ 389 (Pueblo Alto, a greathouse site) and 29SJ 627 (a small-house site). In all cases, the chi-square involving material type showed significant variability between the two sites. Site 29SJ 627 always had higher frequencies of cherty silicified wood, but the frequencies of materials at site 29SJ 389 varied. In ramada/living room floors (Cell 0702), pitstructure trash fill (Cell 0706) and trash mounds (Cell 0711), site 29SJ 389 (Pueblo Alto) showed high frequencies of exotics and splintery silicified wood. In plaza/ramada fill (Cell 0709), site 29SJ 389 had high frequencies of exotics, but not splintery silicified wood. In storage room fill (Cell 0703), site 29SJ 389 had a very high frequency of miscellaneous material (similar to storage room fill for this site in the A.D. 920 to 1020 period), while in pitstructure other fill (Cell 0707), site 29SJ 389 had a moderately high frequency of miscellaneous material. It seems clear that the greathouse versus small-house distinction is strong enough to form two material type assemblages within each of these units.

Artifact Type Assemblages

Artifact types were examined within the 15 cells of the time-space matrix (as with material types) and assemblages were formed on the basis of significant chi-squares. Trash mound fill, A.D. 700 to 820 (Cell 0411), with two proveniences, showed significant variability in artifact types. Site 29SJ 1360 had a considerably higher frequency of tools and utilized and retouched flakes than did site 29SJ 724. Other proveniences from 29SJ 1360 also had a higher frequency of these artifact types. There are two likely explanations. The site was not screened (McKenna 1984), biasing recovery toward large pieces (therefore, more likely utilized flakes or tools). Additionally, 29SJ 1360 seems to have been hastily abandoned with many tools left in place (McKenna 1984). This interpretation was tested by comparing artifact frequencies from two kivas at 29SJ 1360; one which was filled with trash (Kiva A) and one which seemed to have been hastily abandoned (Kiva B) (McKenna 1984). Chi-square results show no significant variability between the two kivas (χ^2=12.69, df=4, P=.02). This suggests that overall proportions of artifact types is more likely a result of excavation technique than of depositional variability. Each site, however, was defined as a separate assemblage for trash mound fill during this period.

Storage room fill, A.D. 920 to 1020 (Cell 0603), showed significant differences among the three proveniences in this cell. Eliminating 29SJ 389, the variation between the two remaining sites was not significant. As discussed above (Material Type Assemblages), site 29SJ 389 has a very high frequency of raw material. This group of artifacts seems unique, thus, storage room fill during this period was divided into two assemblage types; those found at the greathouse (29SJ 389) and those found at small-house sites (29SJ 627 and 29SJ 629), with greathouse assemblages showing high frequencies of unworked rocks of miscellaneous material type.

Room trash fill, A.D. 920 to 1020 (Cell 0605), did not show significant variability among proveniences when artifact types were compared; therefore, these three proveniences were combined into a single assemblage.

Pitstructure trash fill, A.D. 920 to 1020 (Cell 0606), showed significant variability in artifact type among the four proveniences included here. These four proveniences seemed to form two groups: 1) 29SJ 627 and 29SJ 629, and 2) 29SJ 389 and 29SJ 1360. Chi-square comparison of these two groups found significant variability between 29SJ 389 and 29SJ 1360, but not between 29SJ 627 and 29SJ 629. Thus, three artifact type assemblages were defined for this time-space unit; one for 29SJ 389, one for 29SJ 1360, and one for 29SJ 627 and 29SJ 629 combined.

The two proveniences included in pitstructure other fill, A.D. 920 to 1020 (Cell 0607), were not significantly different so were considered one assemblage. The two proveniences included in pitstructure floors, A.D. 920 to 1020 (Cell 0608), were not significantly different and were combined in one assemblage. Plaza/ramada fill, A.D. 920 to 1020 (Cell 0609), showed significant differences among the three proveniences. This chi-square was recalculated without 29SJ 389 and the result was still significant; thus, these three proveniences were all defined as separate assemblages.

The three proveniences included in trash mound, A.D. 920 to 1020 (Cell 0611), were not significantly different. Inspection indicated similar-

ities between sites 29SJ 626 and 29SJ 629 (chi-square was not significant); thus, these two proveniences were considered one assemblage and site 29SJ 627 defined another assemblage.

Miscellaneous proveniences, A.D. 920 to 1020 (Cell 0614), contained four proveniences with significant differences in artifact type. Inspection showed similarities between sites 29SJ 627 and 29SJ 629, and a chi-square showed no significant differences between these two proveniences. Sites 29SJ 389 and 29SJ 1360 appeared to be different from each other and from the other two sites; therefore, artifact type assemblages for time-space unit combine sites 29SJ 627 and 29SJ 629, leaving 29SJ 389 and 29SJ 1360 as separate assemblages.

Artifact types for the A.D. 1020 to 1120 cells were all subject to mixed laboratory techniques. A microscope was not used to analyze some pieces from each group at 29SJ 389; however, ramada/living room floor (Cell 0702), pitstructure trash fill (Cell 0706), and pitstructure other fill (Cell 0707) showed no statistical differences, and each was considered a single artifact type assemblage. In the other three time-space units (storage room fill, Cell 0703; plaza/ramada fill, Cell 0709; trash mounds, Cell 0711) there was significant variability. In storage room fill (Cell 0703), site 29SJ 389 shows a larger quantity of debitage than site 29SJ 627. Although storage room fill (Cell 0703) did not have the high frequencies of "raw material" found at 29SJ 389 in A.D. 920 to 1020 (storage room fill, Cell 0603), the high frequencies of miscellaneous material types in Cell 0703 indicate that a similar situation may be present.

Plaza/ramada fill (Cell 0709) and trash mounds (Cell 0711) both have low frequencies of tools and utilized and retouched flakes at site 29SJ 389, with higher frequencies of these types at site 29SJ 627. The differences between proveniences were quite substantial. Two assemblages were defined for each of these time-space units.

Classification of Material Type Assemblages

The examination of proveniences discussed in the last few pages resulted in the definition of 60 assemblages based on similarities in material type and 56 assemblages based on similarities in artifact type. As discussed above, assemblages combine chipped stone from different sites that fit into the same cell of the time space matrix and are empirically similar, based on both statistical examination and inspection of relative frequencies. Each of the material type assemblages are separately numbered (1-60), as are each of the artifact type assemblages (1-56). The assemblage numbers are shown on Table 3.33 for material type assemblages and on Table 3.34 for artifact type assemblages. The following analysis attempts to explain the similarities and differences among these assemblages as a method of characterizing the overall Chaco Canyon chipped stone assemblage. The assemblages were examined in several different ways: 1) by time period, 2) by spatial class (type of provenience), 3) as greathouse versus small-house sites, and 4) as greathouse versus small-house sites within time-space groups.

Ten material assemblage groups were apparent by inspection (Table 3.35). To test the reality of these groups, a discriminant analysis was run using the six material type groups as dependant variables. Results indicate that 98.25 percent of the 60 cases had been correctly classified. Only one of the 60 assemblages was incorrectly grouped—Assemblage 52 from Group 7. This assemblage had been classified as Group 9, characterized by 35-40 percent exotics and 10-20 percent cherty silicified wood. The high frequency of exotics in these proveniences seems to be the reason for the misclassification. It was classified correctly into Group 7 in the second highest group assignment. The discriminant analysis seems to have confirmed the validity of the 10 groups.

The distribution of these groups within the time-space matrix is shown in Table 3.36. Temporal variation seems most important. Group 1 falls primarily into the period from A. D. 500 to 600. Groups 2-5 are defined by assemblages mainly from A.D. 920 to 1020, although they also include assemblages from periods A.D. 600 to 700, A.D. 700 to 820, and A.D. 820 to 920. Groups 6, 7, and 8 are limited exclusively to A.D. 1020 to 1120. Group 9 is found in the period from A.D. 1120 to 1220 and Group 10 from A.D. 1220 to 1320. Groups 1, 6, 7, 8, 9, and 10 are thus temporarily specific for the periods from A.D. 500 to 600 and A.D. 1020 to 1320. The gap from A.D. 600 to 1020, if made up of a variety of material type groups (Groups 3-5) and other sources of variability, must be sought.

Table 3.33. Assemblages—Material type (N=60).

Space	Period							
	2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill	-	-	-	-	(18) 627	(40) 389	(55) 389	(58) 633
2 Ramada/living room floor	-	-	-	-	(19) 627	(41) 389 (42) 627	-	-
3 Storage room fill	-	-	-	-	(20) 389 (21) 627, 629	(43) 389 (44) 627	-	(59) 633
4 Storage room floor	-	-	-	-	(22) 389	-	-	-
5 Room trash fill	-	-	-	-	(23) 391 (24) 627, 629	(45) 627	-	-
6 Pitstructure trash fill	(1) 423	(7) 1659	(10) 724	(15) 627	(25) 389,629 (26) 627, 1360	(46) 389 (47) 627	(56) 389	(60) 633
7 Pitstructure other fill	(2) 423	(8) 299	(11) 724	-	(27) 629 1360	(48) 389 (49) 627	-	-
8 Pitstructure floors	(3) 423	-	(12) 724	(16) 627	(28) 629 1360	-	-	-
9 Plaza/ramada fill	-	-	-	-	(29) 389 (30) 629,1360	(50) 389 (51) 627	(57) 389	-
10 Plaza/ramada surfaces	-	-	-	-	-	-	-	-
11 Trash mound fill	(4) 423	-	(13) 724 1360	(17) 629	(31) 626 (32) 627 (33) 629	(52) 389 (53) 627	-	-
12 Site feature fill/floor	-	-	-	-	(34) 627	-	-	-
13 Site surface	(5) 423	(9) 1659	(14) 724	-	(35) 629	-	-	-
14 Miscellaneous	(6) 423	-	-	-	(36) 389 (37) 627 (38) 629 (39) 1360	(54) 389		

( ) Number in parenthesis indicates assemblage number.

Table 3.34. *Assemblages—Artifact type (N=56).*

Space	Period 2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill	-	-	-	-	(18) 627	(39) 389	(51) 389	(54) 633
2 Ramada/living room floor	-	-	-	-	(19) 627	(40) 389 627	-	-
3 Storage room fill	-	-	-	-	(20) 389 (21) 627 629	(41) 389 (42) 627	-	(55) 633
4 Storage room floor	-	-	-	-	(22) 389	-	-	-
5 Room trash fill	-	-	-	-	(23) 391 627 629	(43) 627	-	(56) 633
6 Pitstructure trash fill	(1) 423	(7) 1659	(10) 724	(15) 627	(24)627,629 (25) 389 (26) 1360	(44) 389 627	(52) 389 1/2	-
7 Pitstructure other fill	(2) 423	(8) 299	(11) 724	-	(27) 629 1360	(45) 389 627	-	-
8 Pitstructure floors	(3) 423	-	(12) 724	(16) 627	(28) 629 1360	-	-	-
9 Plaza/ramada fill	-	-	-	-	(29) 389 (30) 629 (31) 1360	(46) 389 (47) 627	(53) 389	-
10 Plaza/ramada surfaces	-	-	-	-	-	-	-	-
11 Trash mound fill	(4) 423		(13) 724 (13.5) 1360	(17) 629	(32) 627 (33) 626 629	(48) 389 (49) 627	-	-
12 Site feature fill/floor	-	-	-	-	(34) 627	-	-	-
13 Site Surface	(5) 423	(9) 1659	(14) 724	-	(35) 629	-	-	-
14 Miscellaneous	(6) 423	-	-	-	(36)627,629 (37) 389 (38) 1360	(50) 389	-	-

( ) Number in parenthesis indicates assemblage number.

Table 3.35. Classification of material type assemblages.

Group	Characteristics	% of Characteristic Type	Assemblages
1	High surface chert	25 - 40	1,2,3,4,5,6,8
	Exotics	2 - 9	
2	Cherty silicified wood	35 - 60	34,31,18,32,39,26,33,35,15,16,17
	Chalcedonic silicified wood	20 - 32	
	Exotics	0 - 5	
3	Chalcedonic silicified wood	35 - 60	30,25,24,38,27,28,7,10,12,13,14,21
	Cherty silicified wood	20 - 35	
	Exotics	0 - 5	
4	Cherty silicified wood	24 - 32	11,19,37
	Chalcedonic silicified wood	24 - 32	
5	Exotics	10 - 25	29,36,22,9
	Chalcedonic silicified wood	20 - 60	
6	Cherty silicified wood	30 - 45	53,42,47,49,45,44,51
	Exotics	6 - 10	
7	Exotics	24 - 55	46,52,41,40,50
	Splintery silicified wood	15 - 25	
8	Exotics	13 - 17	54,48,43
	Others	25 - 55	
9	Exotics	35 - 40	55,56
	Cherty silicified wood	10 - 20	
10	Exotics	10 - 15	58,59,60
	Chalcedonic silicified wood	25 - 36	
Unclassified			20,23,57

Site type may account for some of the variability of these groups. From A.D. 920 to 1020, material Group 5 consists exclusively of assemblages from greathouses, while Groups 2-4 are primarily from small-house sites. From A.D. 1020 to 1120, Group 6 is limited to small-house sites, while Groups 7 and 8 are from greathouses. Groups 2 and 3, which have reversed percentages of two local materials, consist primarily of two different sites; Group 2 from site 29SJ 627 and Group 3 from 29SJ 629. Group 4, with almost equal frequencies of the same two local materials, is made up of assemblages from several different sites (including one greathouse site).

Small-house sites from A.D. 1020 to 1120 fall into a single group (Group 6), but greathouses in this period fall into two groups (Groups 7 and 8). This material is from site 29SJ 389. Group 7 is composed of living room fill and floor, trash mounds, and pithouse other fill, while Group 8 is storage room fill, pithouse trash fill, and miscellaneous proveniences. Activity differences between living rooms and storage rooms may affect the composition of these material type groups.

A principal component analysis was run using all 60 material type assemblages. Material types were grouped as usual and showed the first three eigenvectors account for 57 percent of the variance. Factor loadings were as follows:

Factor 1: High negative—Washington Pass chert and Zuni wood,

Factor 2: High positive—high surface chert and obsidian, and

Factor 3: High negative—Morrison Formation material and obsidian.

A plot of Factors 1 and 2 (Figure 3.5 shows a large cluster consisting of almost all the assemblages from site 29SJ 389 (A.D. 920 to 1220). A second cluster contains all the assemblages from site 29SJ423 (A.D. 500 to 600). A third less well-defined cluster contained all the assemblages from site 29SJ 633 (A.D. 1220 to 1320). These three clusters account

Table 3.36. Distribution of material groupings from Table 3.33 in time-space matrix.

	Period							
Space	A.D. 500s	A.D. 600s	A.D. 700-820	A.D. 820-920	A.D. 920-1020	A.D. 1020-1120	A.D. 1120-1220	A.D. 1220-1320
1 Ramada/living room fill					(18) 2	(40) 7	(55) 9	(58) 10
2 Ramada/living room floor					(19) 4	(41) 7 (42) 6		
3 Storage room fill					(20) Uncl (21) 3	(43) 8 (44) 6		(59) 10
4 Storage room floor					(22) 5			
5 Room trash fill					(23) Uncl (24) 3	(45) 6		
6 Pitstructure trash fill	(1) 1	(7) 3	(10) 3	(15) 2	(25) 3 (26) 2	(46) 7 (47) 6	(56) 9	(60) 10
7 Pitstructure other fill	(2) 1	(8) 1	(11) 44		(27) 3	(48) 8 (49) 6		
8 Pitstructure floors	(3) 1		(12) 3	(16) 2	(28) 3			
9 Plaza/ramada fill					(29) 5 (30) 3	(50) 7 (51) 6	(57) Uncl.	
10 Plaza/ramada surfaces								
11 Trash mound fill	(4) 1		(13) 3	(17) 2	(31) 2 (32) 2 (33) 2	(52) 7 (53) 6		
12 Site feature fill/floor					(34) 2			
13 Site surface	(5) 1	(9) 5	(14) 3		(35) 2			
14 Miscellaneous	(6) 1				(36) 5 (37) 4 (38) 3 (39) 2	(54) 8		

Uncl. = unclassified.
( ) Number in parenthesis indicates assemblage number.

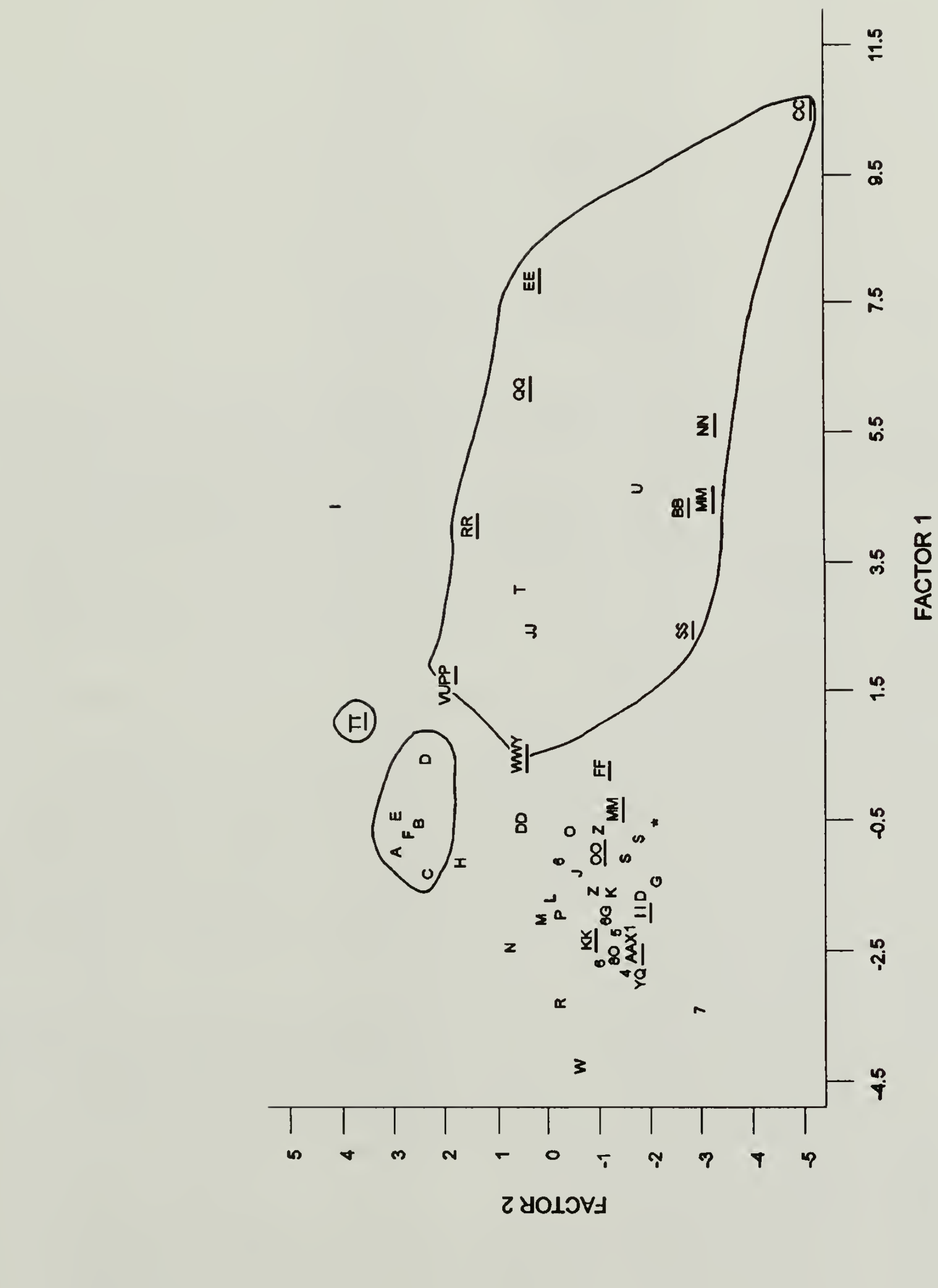

Figure 3.5. Plot of material type assemblages against principal components.

Key for Figure 3.5. Provenience Codes.

Code	Time Period	Spatial Unit	Site
A	500-600	Pitstructure trash fill	29SJ 423
B	500-600	Pitstructure other fill	29SJ 423
C	500-600	Pitstructure floor	29SJ 423
D	500-600	Trash mound	29SJ 423
E	500-600	Site surface	29SJ 423
F	500-600	Miscellaneous proveniences	29SJ 423
G	600-700	Pitstructure trash fill	29SJ 1659
H	600-700	Pitstructure other fill	29SJ 299
I	600-700	Site surface	29SJ 1659
J	700-820	Pitstructure trash fill	29SJ 724
K	700-820	Pitstructure other fill	29SJ 724
L	700-820	Pitstructure floors	29SJ 724
M	700-820	Trash mound	29SJ 724
N	700-820	Site surface	29SJ 724
O	820-920	Pitstructure trash fill	29SJ 627
P	820-920	Pitstructure floors	29SJ 627
Q	820-920	Trash mound	29SJ 629
R	920-1020	Ramada/living room fill	29SJ 627
S	920-1020	Ramada/living room floors	29SJ 627
T	920-1020	Storage room fill	29SJ 389
U	920-1020	Storage room fill	29SJ 629
V	920-1020	Storage room floor	29SJ 389
W	920-1020	Room trash fill	29SJ 391
X	920-1020	Room trash fill	29SJ 627
Y	920-1020	Pitstructure trash fill	29SJ 629
Z	920-1020	Pitstructure trash fill	29SJ 1360
0	920-1020	Pitstructure other fill	29SJ 629
1	920-1020	Pitstructure floors	29SJ 1360
2	920-1020	Plaza/ramada fill	29SJ 389
3	920-1020	Plaza/ramada fill	29SJ 629
4	920-1020	Trash mound	29SJ 626
5	920-1020	Trash mound	29SJ 627
6	920-1020	Trash mound	29SJ 629
7	920-1020	Site features	29SJ 627
8	920-1020	Site surface	29SJ 629
9	920-1020	Miscellaneous	29SJ 389
$	920-1020	Miscellaneous	29SJ 627
%	920-1020	Miscellaneous	29SJ 629
AA	920-1020	Miscellaneous	29SJ 1360
BB	1020-1120	Ramada/living room fill	29SJ 389
CC	1020-1120	Ramada/living room floor	29SJ 389
DD	1020-1120	Ramada/living room floor	29SJ 627
EE	1020-1120	Storage room fill	29SJ 389
FF	1020-1120	Storage room fill	29SJ 627
GG	1020-1120	Room trash fill	29SJ 627
HH	1020-1120	Pitstructure trash fill	29SJ 389

Code	Time Period	Spatial Unit	Site
II	1020-1120	Pitstructure trash fill	29SJ 627
JJ	1020-1120	Pitstructure other fill	29SJ 389
KK	1020-1120	Pitstructure other fill	29SJ 627
LL	1020-1120	Plaza/ramada fill	29SJ 389
MM	1020-1120	Plaza/ramada fill	29SJ 627
NN	1020-1120	Trash mound	29SJ 389
OO	1020-1120	Trash mound	29SJ 627
PP	1020-1120	Miscellaneous	29SJ 389
QQ	1120-1220	Ramada/living room fill	29SJ 389
RR	1120-1220	Pitstructure trash fill	29SJ 389
SS	1120-1220	Plaza/ramada fill	29SJ 389
TT	1220-1320	Ramada/living room fill	29SJ 633
UU	1220-1320	Storage room fill	29SJ 633
WW	1220-1320	Room trash fill	29SJ 633

for a little over one-third of the 60 assemblages. Almost all of the remaining two-thirds can be found in one relatively tight cluster. (A plot of Factor 1 against Factor 3 shows the same clustering of 29SJ 389 proveniences, but the other two clusters are not apparent.) The principal components analysis indicates that much of the material type variability can be attributed to both site type and period, supporting the interpretations given above.

Classification of Artifact Type Assemblages

Artifact type assemblages were examined somewhat differently than material type assemblages. Artifact types were grouped as described below, and relative frequencies were used to calculate a mean and standard deviation. Each artifact type was examined for variation from the mean and attempts were made to explain the variation.

Artifact types were grouped as follows (see Table 3.2 for artifact type numbers):
Projectile points (202-207);
Large point/knife (208, 215, 219, 221, 223);
Miscellaneous blade (209, 210, 213, 214, 220, 239);
Drill (231-237);
Scraper (211, 212);
Miscellaneous unclassified tool (217);
Wedge (238);
Utilized and retouched flakes (241, 242); and
Debitage (243, 249, 251, 770).

Generally, assemblages consisted of 1-2 percent formal tools, 2-3 percent retouched flakes, 20-25 percent utilized flakes, and 65-75 percent debitage. Utilized and retouched flakes are combined here because of the expedient nature of these two tool types.

Debitage—Utilized/Retouched Flakes

Debitage and utilized/retouched flakes together made up about 95-98 percent of most assemblages. Proportions of debitage and utilized/retouched flakes are negatively correlated (-0.9260, $n=57$, $P<.001$), so that variation in one artifact type explains variation in the other. For this reason, initial discussion is limited to debitage. Debitage percentages ($n=57$; $\bar{x}=69.66$; $sd=10.58$) had a relatively normal distribution with 65 percent of the assemblages falling within one standard deviation of the mean. Twelve assemblages fell more than one standard deviation below the mean (Table 3.37). Eight of these assemblages had less than 100 pieces, which probably indicates that they deviate from the mean because of unreliable sample size. Three of the remaining assemblages, which contained more than 100 pieces, were from site 29SJ 1360. As noted in the section on artifact type assemblages, this site may have a recovery bias toward finished tools but also may be depositionally different from other sites. The fourth assemblage consisted of living room fill from site 29SJ 389 (Period 8, A.D. 1120 to 1220). As noted in the section on spatial variation of formal tools (p. 573), roof-fall material in this fill included many tools abandoned on the roof and this deposition probably extends to utilized/retouched flakes.

Table 3.37. Artifact type assemblages with debitage frequency greater than 1 standard deviation from the mean.

Assemblage	Frequency	Period (A.D.)	Sites	Spatial Unit
		Below Mean		
8	67	600-700	299	Pitstructure other fill
9	55	600-700	1659	Site surface
10	51	700-820	724	Pitstructure trash
12	71	700-820	724	Pitstructure floors
26	139	920-1020	1360	Pitstructure trash
27	464	920-1020	629/1360	Pitstructure other fill
31	82	920-1020	1360	Plaza/ramada fill
34	50	920-1020	627	Site features/fill floor
38	396	920-1020	1360	Miscellaneous
42	57	1020-1120	627	Storage room fill
47	50	1020-1120	627	Plaza/ramada fill
51	198	1120-1220	389	Ramada/living room fill
		Above Mean		
20	261	920-1020	389	Storage room fill
29	534	920-1020	389	Plaza/ramada fill
35	276	920-1020	629	Site surface
37	59	920-1020	389	Miscellaneous
39	192	1020-1120	389	Ramada/living room fill
41	110	1020-1120	389	Storage room fill
48	4,569	1020-1120	389	Trash mound
53	170	1120-1220	389	Plaza/ramada fill

Eight assemblages fell more than one standard deviation above the mean (Table 3.37). Seven of these assemblages had frequencies of greater than 100. All but one of the seven were from site 29SJ 389. (The other assemblage was from site 29SJ 629.) Laboratory procedures at site 29SJ 389 differed from those at the other sites, almost certainly reducing the frequency of utilized and retouched flakes that were identified (see Site Sampling Biases, above).

In general, it seemed that proportions of debitage and utilized/retouched flakes varied little among these assemblages and most variability can be explained by variation in field and laboratory technique or depositional differences at specific sites.

Formal Tools

Projectile Points. Projectile points were the most frequent and ubiquitous tool form. Classes of projectile points were defined using a method similar to that used for debitage and utilized/retouched flakes. Relative frequencies were used to calculate a mean and standard deviation (Assemblage 9 was not included in these calculations because it was so far above the norm) and assemblages with values more than one standard deviation above or below the mean were examined (Table 3.38). The total number of projectile points in the assemblages is low (N=175) and relative frequency is never greater than 6 percent (except for Assemblage 9), and sample size undoubtedly affects results.

Table 3.38. Distribution of projectile points in artifact type assemblages.

	Period							
Space	2 A.D. 500s	3 A.D. 600s	4 A.D.700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill					(18)	(39)	(51) ++	(54) -
2 Ramada/living room floor					(19) -	(40)		
3 Storage room fill					(20) (21)	(41) (42) -		(55) +
4 Storage room floor					(22)			
5 Room trash fill					(23)	(43)		(56)
6 Pitstructure trash fill	(1)	(7) +	(10) -	(15)	(24) (25) (26) ++	(44)	(52)	
7 Pitstructure other fill	(2)	(8)	(11) -		(27)	(45) +		
8 Pitstructure floors	(3) ++		(12)	(16) -	(28) -			
9 Plaza/ramada fill					(29) (30) (31)	(46) + (47)	(53)	
10 Plaza/ramada surfaces								
11 Trash mound fill	(4)		(13)	(17) -	(32)	(48)		
			(13.5)		(33)	(49)		
12 Site feature fill/floor					(34) -			
13 Site surface	(5) +	(9) ++	(14)		(35)			
14 Miscellaneous	(6)				(36) (37) - (38)	(50)		

Projectile point percentages:
x̄ = 1.05%
s.d. = 1.21
Var. = 1.449

( ) Number in parenthesis indicates assemblage number.

++ = 3 SD above mean or more.
\+ = 2 SD above mean.
\- = No projectile points present.

Nine assemblages fell more than one standard deviation above the mean. Two are from site surface where projectile points are more likely to have been collected than other lithics (one of these assemblages is from site 29SJ 1659, see greathouse and small-house sites, below). Assemblage 26 (pitstructure trash fill, A.D. 920 to 1020) consists of material from site 29SJ 1360. The unusually high frequency of tools at 29SJ 1360 has been noted previously as the result of field recovery technique or the abrupt abandonment of the site (see Artifact Type Assemblages). Pitstructure floors (A.D. 500 to 600), another assemblage with a high proportion of projectile points, contains material from site 29SJ 423 which has been described as the possible locus of tool manufacture. Ramada/living room fill (A.D. 1120 to 1220) may contain roof-fall material which may have been the locus of tool use areas.

Of the remaining five assemblages, four have relatively low frequencies of all chipped stone (from 58 to 123). As noted above, small sample size greatly affects relative frequencies of rare artifact types.

Other Artifacts. The frequencies of all other artifacts types were low:

Large point/knives	12
Miscellaneous blades	78
Drills	63
Scrapers	7
Wedge	10
Miscellaneous unclassified tool	9

Because the frequencies were low, only the presence or absence of each of these artifact types was noted for each assemblage. Presence of rare tool types is partly correlated with sample size. Almost half of the assemblages that contain these types have a sample size greater than 500. The miscellaneous blades are widely distributed (Table 3.39). Every assemblage in the period from A.D. 500 to 600 contains this artifact type. These assemblages are all from site 29SJ 423, a possible tool-producing area, and this artifact type includes unfinished tools or tool fragments. Miscellaneous blades occur on floor surfaces (in two cases), but generally occur in fill, especially trash fill. Broken or unfinished tools might have been discarded in these sorts of contexts.

Drills (Table 3.40) occur exclusively in fill; especially trash fill. These tools are probably expediently produced (Lekson, Chapter 4 of this volume) and may have been discarded after use. Drills are also found more frequently in the period from A.D. 920 to 1020 at village sites. As noted in the introduction to the discussion on assemblages, sites in this period may have been the locus of turquoise-working activities for which drills were used.

Large point/knives, scrapers, wedges, and miscellaneous unclassified tools are all very low in frequency (Table 3.41). Wedges are found primarily in pitstructure trash fill and trash mound fill. Only one wedge was found before A.D. 920. These tools are expediently made and may have been expediently discarded. Scrapers are found almost exclusively from A.D. 920 to 1020 at both greathouse and small-house sites. They may indicate activities specific to this period. Large point/knives and miscellaneous unclassified tools are widely distributed in both time and space and no patterning was noted for these two artifact types.

Unusual Proveniences

The following section describes certain sites at Chaco Canyon or proveniences within sites that had distinctive or unusual evidence of chipped stone use. Chipped stone at some proveniences, in association with other artifact types, suggested specific activities, such as jewelry-making.

Site 29SJ 423

This site included the earliest excavated material in the collection (Period 2, A.D. 500s). The site produced a large number of tools (77; 3.0 percent of chipped stone at the site) and almost half of these tools were unfinished (Lekson, Chapter 4 of this volume). Excavations at the site centered on a great kiva, but the unfinished tools were all from the fill of the great kiva or from other proveniences. Less than 10 percent of the tools were exotic material; an unusually low percentage for any site or period. It would seem that this site was a locus of tool manufacturing using locally available material.

Table 3.39. Presence of miscellaneous blade fragments in artifact type assemblages.

Space	Period: 2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill					(18)	(39)	(51) +	(54)
2 Ramada/living room floor					(19) +	(40)		
3 Storage room fill					(20) (21)	(41) (42)		(55)
4 Storage room floor					(22)			
5 Room trash fill					(23) +	(43)		(56)
6 Pitstructure trash fill	(1) +	(7)	(10)	(15)	(24) + (25) (26) +	(44) +	(52) +	
7 Pitstructure other fill	(2) +	(8) +	(11)		(27)	(45)		
8 Pitstructure floors	(3) +		(12)	(16)	(28)			
9 Plaza/ramada fill					(29) + (30) (31)	(46) (47)	(53)	
10 Plaza/ramada surfaces								
11 Trash mound fill	(4) +		(13) +	(17)	(32) +	(48) +		
			(13.5)		(33) +	(49) +		
12 Site feature fill/floor					(34)			
13 Site surface	(5) +	(9) +	(14)		(35) +			
14 Miscellaneous	(6) +				(36) (37) (38)	(50)		

( ) Number in parenthesis indicates assemblage number.

Table 3.40. Presence of drills in artifact type assemblages.

	Period							
Space	2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill					(18)	(39)	(51)	(54)
2 Ramada living room floor					(19)	(40)		
3 Storage room fill					(20) (21)	(41) (42)		(55)
4 Storage room floor					(22)			
5 Room trash fill					(23)	(43) +		(56)
6 Pitstructure trash fill	(1) +	(7)	(10) +	(15)	(24) + (25) (26)	(44)	(52) +	
7 Pitstructure other fill	(2) +	(8)	(11)		(27) +	(45)		
8 Pitstructure floors	(3)		(12)	(16)	(28)			
9 Plaza/ramada fill					(29) (30) (31) +	(46) (47)	(53)	
10 Plaza/ramada surfaces								
11 Trash mound fill	(4)		(13) + (13.5)	(17)+	(32) + (33) +	(48) + (49)		
12 Site feature fill/floor					(34) +			
13 Site surface	(5) +	(9)	(14)		(35)			
14 Miscellaneous	(6) +				(36) + (37) (38) +	(50)		

( ) Number is parenthesis indicates assemblage number.

Table 3.41. Presence of miscellaneous low frequency formal tools in artifact type assemblages.

	Period							
Space	2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320
1 Ramada/living room fill					(18)	(39)	(51)	(54)
2 Ramada/living room floor					(19)	(40) K		
3 Storage room fill					(20) (21)	(41) (42)		(55) U
4 Storage room floor					(22) S			
5 Room trash fill					(23) U	(43)		(56) E/K
6 Pitstructure trash fill	(1) U/K	(7)	(10) K	(15)	(24) E/K (25) (26) S	(44) E	(52)	
7 Pitstructure other fill	(2)	(8) K	(11)		(27) S/K	(45)		
8 Pitstructure floors	(3) U		(12)	(16)	(28)			
9 Plaza/ramada fill					(29) (30) (31)	(46) (47)	(53)	
10 Plaza/ramada surfaces								
11 Trash mound fill	(4)		(13) K	(17) U/K	(32) (33) U	(48) K (49) E		
12 Site feature fill/floor					(34)			
13 Site surface	(5) U	(9) E/U	(14)		(35)			
14 Miscellaneous	(6) U/S				(36) S/K (37) (38) S	(50)		

E = Piece esquille.
U = Miscellaneous unclassified tool.
( ) Number in parenthesis indicates assemblage number.
K = Large point/knife.
S = Scraper.

Site 29SJ 629 (mostly from Period 6, A.D. 920 to 1020)

This site produced turquoise debris associated with lapidary stones, indicating turquoise ornament production (Windes 1993). One large pit (OP1) contained thousands of pieces of turquoise (broken beads and debris) and several lapidary stones, perhaps from a bead manufacturing area located in the adjacent plaza. Over 400 pieces of chipped stone were recovered from this pit and 75 percent were of chalcedonic silicified wood; the highest percentage of this material type from one provenience in the collection. Three expedient perforators of chal-cedonic silicified wood were also found in the pit, which also had a very high frequency of utilized flakes.

Site 29SJ 389

Plaza Grid 8

The association of chalcedonic silicified wood with bead manufacturing debris (Mathien 1987) was also found at site 29SJ 389. The earliest deposits at 29SJ 389 (A.D. 920 to 1020) coincide with the bead manufacturing activities at 29SJ 629. A large plaza area (Plaza Grid 8, Layer 15) also contained many beads and 44 percent chalcedonic silicified wood. It would seem that chalcedonic silicified wood was used in producing beads at both greathouse and small-house sites.

Room 110

Room 110, located at site 29SJ 389, produced large quantities of chipped stone, largely from pits on several superimposed floors. It seems to have been the locus of chipped stone manufacture. Of this material, 53 percent was exotic (Washington Pass chert and Zuni wood). One pit contained over 100 tiny flakes of Zuni wood and probably represents one chipping episode. Washington Pass chert occurred as both flakes and cores. Five of the seven cores recovered from the floors of Room 110 were Washington Pass chert. Washington Pass chert flake size was large, averaging 4.9 g (over twice as large as Washington Pass chert in the trash mound at 29SJ 389). No Washington Pass chert finished tools or broken-in-manufacture tools were recovered. Room 110 might have been used for the production of flakes of Washington Pass chert or possibly tools (or a tool) of Zuni wood.

Site 29SJ 1659

Excavations at site 29SJ 1659 (Shabik'eshchee Village) produced less than 200 pieces of chipped stone, but this constitutes over half of the material from the period from A.D. 600 to 700 (Period 3). One-third of the 29SJ 1659 chipped stone was from surface collections and, of course, this included a disproportionately large number of projectile points. Most of this surface material was not collected by the Chaco Project. Roberts (1929) thought that the projectile points found on the surface of this site were later than excavated artifact types, therefore, he did not combine surface and excavated materials in the same temporal divisions as has been done here.

Chipped Stone Analysis in a Regional Perspective

Evidence from virtually all types of artifacts, from architecture, and of course from the discovery of prehistoric roads, indicates that Chaco Canyon functioned as the center of a large regional system. The exact role that Chaco played in that system has not been clearly defined. The hypothesis that has guided much of the work of the Chaco Project is that Chaco played a central role in a regional exchange system (Judge 1979; Schelberg 1980; Tainter and Gillio 1980). Alternately, seasonal aggregation of surrounding populations in Chaco Canyon has also been suggested (Loose and Lyons 1976; Toll 1984; Windes 1982).

The chipped stone analysis undertaken in this study can be used to evaluate the role of Chaco Canyon in a regional system through an examination of the following topics: 1) regional patterns of raw material acquisition, 2) the volume of exotic chipped stone imported into Chaco Canyon, 3) consumption of chipped stone, 4) differential consumption of chipped stone at greathouse and small-house sites, and 5) evidence of craft specialization at Chaco.

The temporal framework used throughout this study must be reevaluated in exploring these topics. The topics focus on the 100-year period from A.D. 1020 to 1120, a period defined by the presence of Gallup Black-on-white ceramics. Chipped stone from this period came primarily from the Pueblo Alto greathouse and one small-house site, 29SJ 627. The following discussion is complicated by the fact that material from Pueblo Alto that is classified into the

A.D. 1020 to 1120 period probably actually dates to a shorter span between A.D. 1050 and 1100. As discussed below, temporal overlap between greathouses and small-houses in the proveniences excavated by the Chaco Project must be questioned.

Regional Patterns of Exotic Material Acquisition

With the exception of relatively few pieces of obsidian, the sources for exotic chipped stone are located less than 150 km from Chaco Canyon. Two hundred kilometers has been described as the "supply zone" with "a pattern arising largely from single journeys" (Renfrew 1977:84). The use of fall-off curves to infer modes of exchange may not be appropriate at these short distances. Fall-off curves, however, can be used to examine the magnitude of contact with other areas and to evaluate differential access to resources.

To examine the role of Chaco Canyon as a central place in a regional exchange system, chipped stone material frequencies from other sites in the San Juan Basin were examined (Jacobson 1977, 1984; Powers et al., 1983; Windes and Cameron 1981). Fall-off curves were plotted for clusters of sites at increasing distance from source material. (This discussion combined site assemblages identified temporally as Pueblo II and Pueblo III periods). Only three of the five major exotics were considered: Washington Pass chert, Morrison Formation material, and yellow-brown spotted chert. Obsidian is considered elsewhere (see Obsidian Sources), and Zuni wood is a very low frequency exotic in Chaco Canyon.

Figure 3.6 graphs the percentage of Washington Pass chert at locations of increasing distance from the source. Both percentages and distance have been converted to a logarithmic scale to increase linearity. An initial plot used natural distance. The best fit selected for this regression was A+B and log(x), so log(x) was used. A regression line fitted to the curve is significant at the 0.01 level with a correlation coefficient of 0.84. The regression line predicts only 1 percent Washington Pass chert at Chaco Canyon, which is close to the percentage found during the period from A.D. 920 to 1020. After A.D. 1020, however, the frequency is significantly higher (20 percent).

Figure 3.7 repeats this procedure for yellow-brown spotted chert. The regression line is significant at the 0.01 level with a correlation coefficient of 0.77. The frequencies of this material in Chaco Canyon are not higher than would be predicted by the regression (except for the period from A.D. 1120 to 1220 when the frequency is only slightly higher than predicted).

A regression of Morrison Formation material was not significant at the 0.01 level (correlation coefficient of 0.18) (Figure 3.8). The occurrence of this material seems random with respect to the presumed source. Outcrops of usable material have been reported only in the Four-Corners area (Shelley personal communication); however, the Morrison Formation material does outcrop at many other locations around the San Juan Basin (Figure 3.1). Figure 3.8 indicates that more of these outcrops may have been exploited than previously assumed.

Washington Pass chert was almost 30 percent of the chipped stone assemblage during the period represented by Gallup ceramics at Pueblo Alto—the highest exotic percentage at any excavated site during any period. The total amount of this material during the 50 years of this period has been estimated as approximately 117 kg (257 lbs) or 2.3 kg per year (see Consumption of Chipped Stone, below). Surface material on the trash mounds at Chetro Ketl and Pueblo Bonito indicate that Washington Pass chert frequencies at these sites could be as high as 50 percent (Windes and Cameron—field notes, 1980-1981); however, even doubling the estimated 2.3 kg a year to an import rate of 4.6 kg a year does not suggest trade with the Washington Pass area on the scale documented for ceramics. Almost 50,000 pots have been estimated to have been imported from the Chuska Mountain area and deposited in the Pueblo Alto trash mound during the period represented by Gallup phase ceramics.

Even though the volume of import of Washington Pass chert may not have rivaled the volume of import of ceramics into Chaco Canyon, the high frequency of this material supports the hypothesis that Chaco may have played a central role in an exchange system. A study by Louann Jacobson

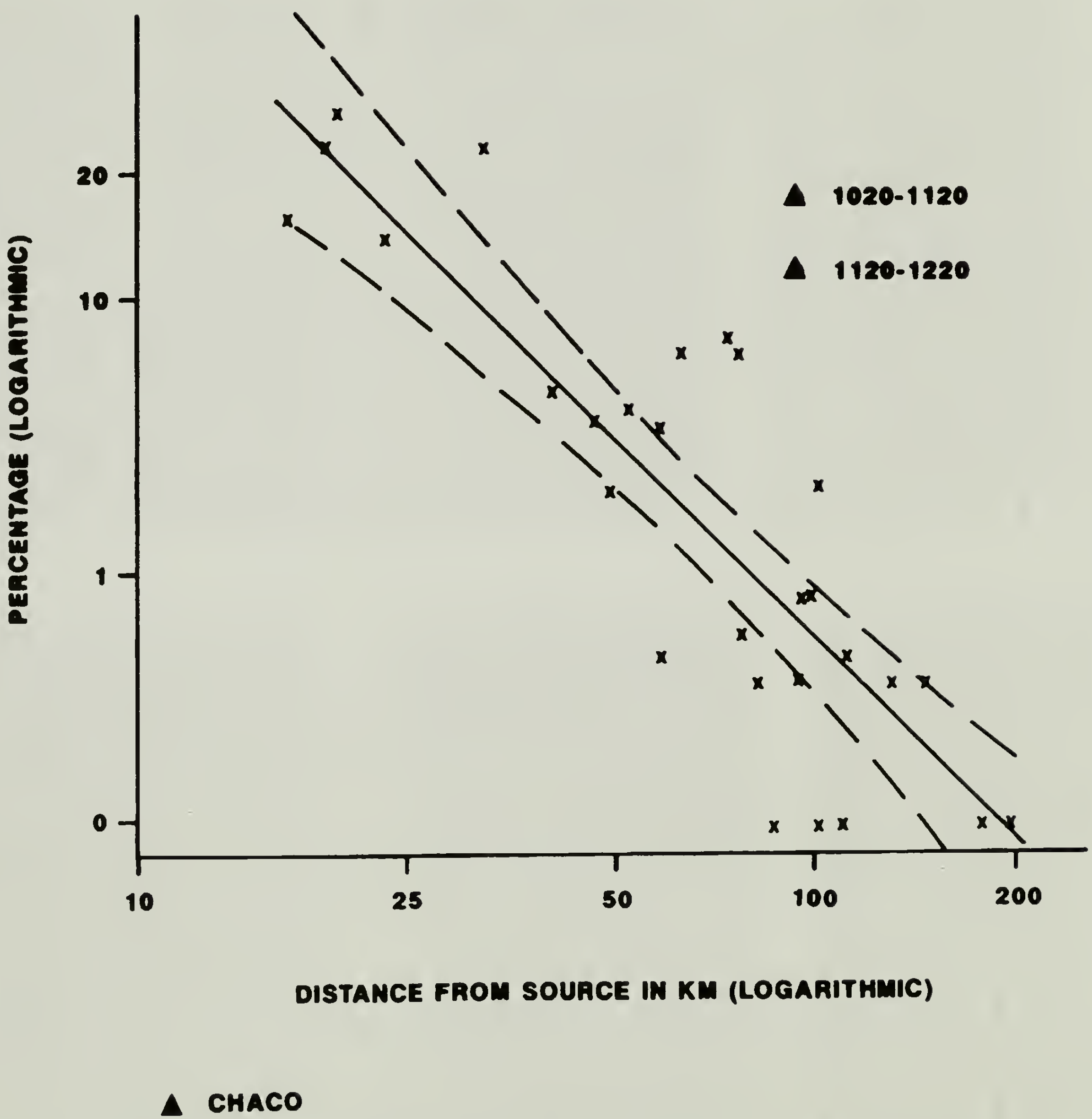

Figure 3.6. *Fall-off in abundance of Washington Pass chert with distance from source.*

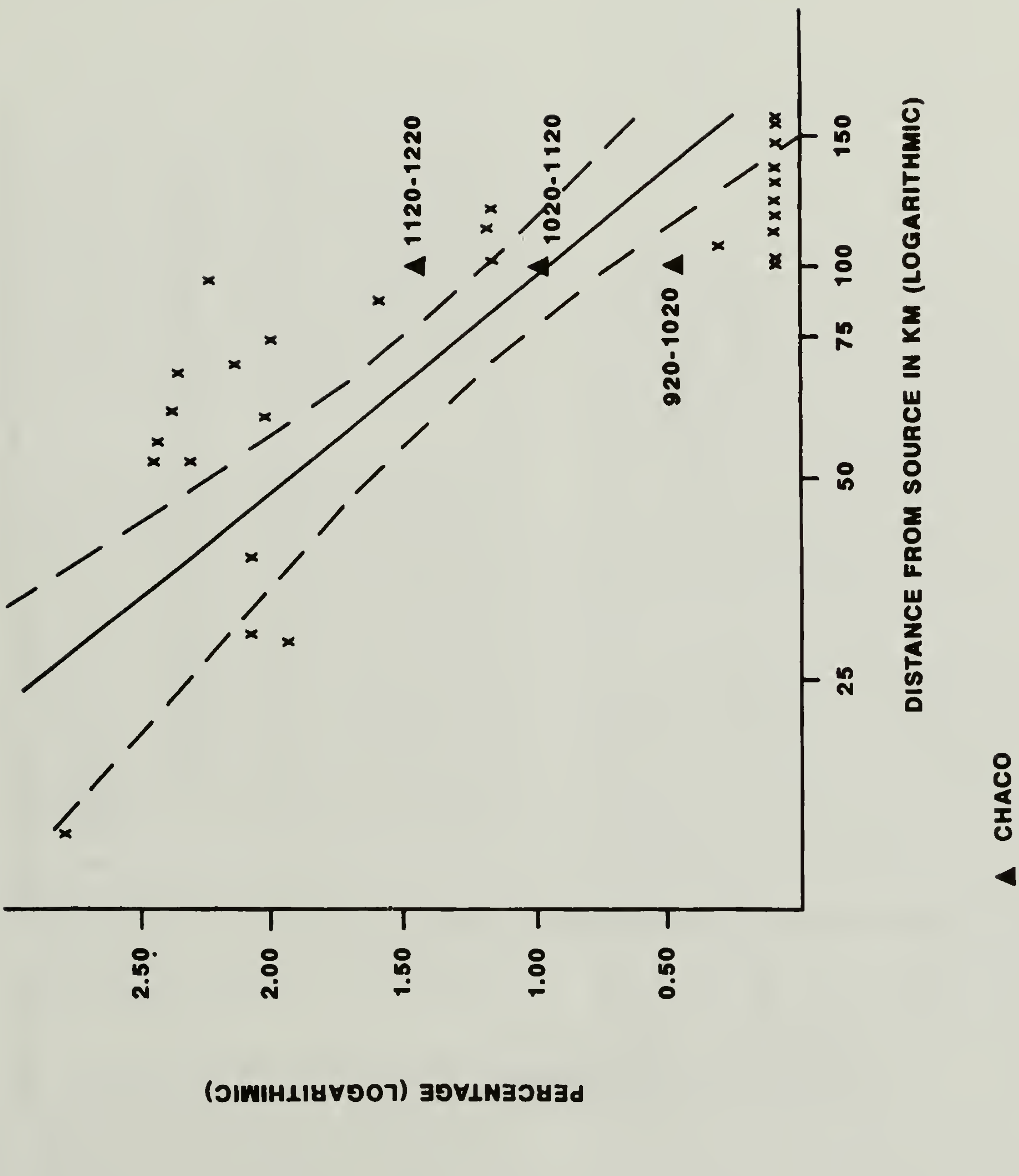

Figure 3.7. *Fall-off in abundance of yellow-brown spotted chert with distance from source.*

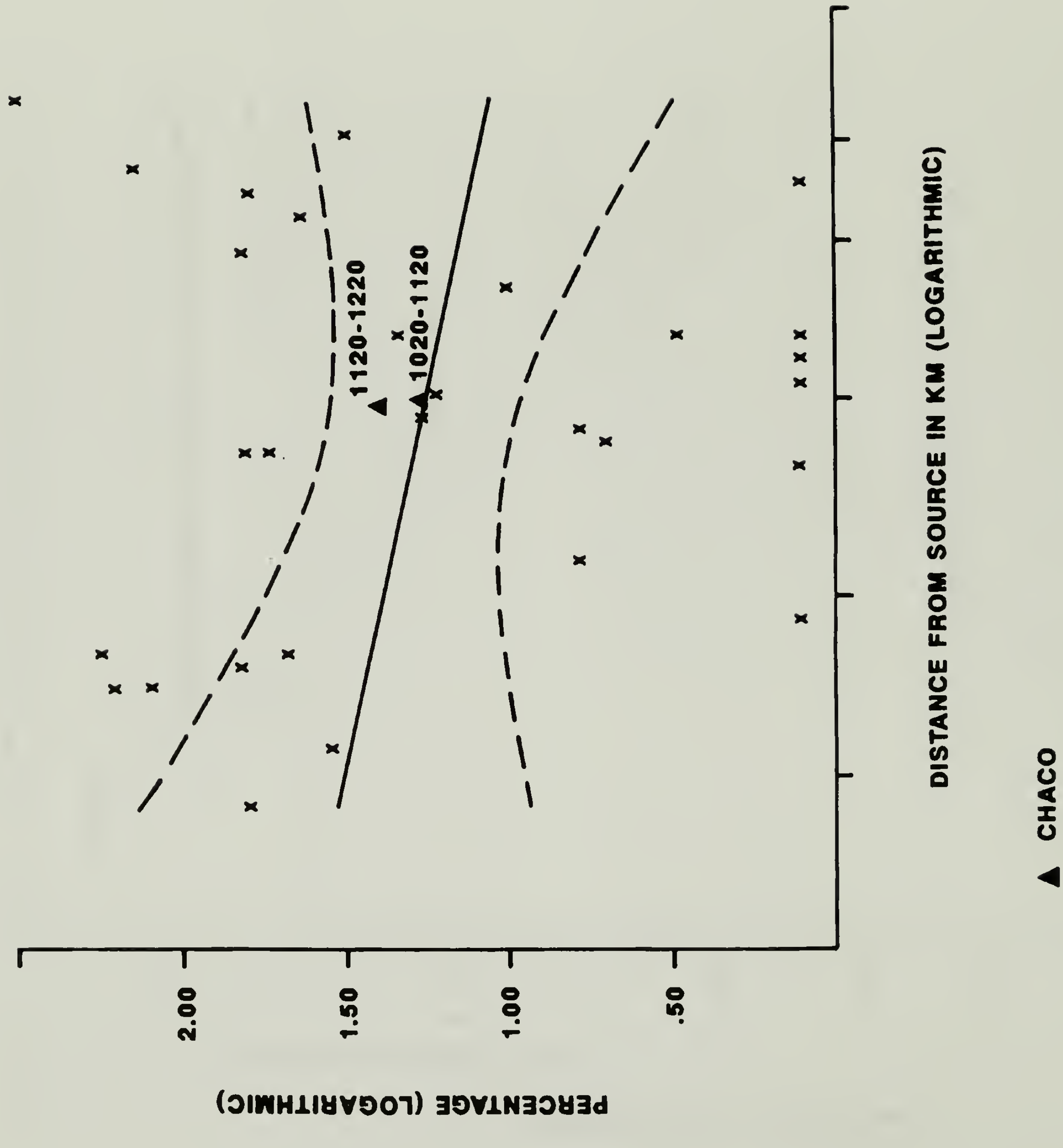

Figure 3.8. Fall-off in abundance of Morrison Formation material with distance from source.

(1977, 1984) suggests that a redistributive system may have been in operation for the Chaco system, but only for the Chacoan outliers immediately surrounding the Canyon, and not for the larger region. Her conclusions are supported by Figure 3.6. The points above the uppermost confidence band represent outliers close to Chaco.

Quantity of Imported Chipped Stone Material

Washington Pass chert comprised 27 percent of the chipped stone assemblage at Pueblo Alto from A.D. 1050 to 1100, the highest exotic material percentage at any excavated site during any period. An estimate of the total quantity of Washington Pass chert imported during this period was calculated from the weight of the excavated material and the percentage of the site dug. The resulting figure was approximately 130 kg. Other types of exotic chipped stone material at Pueblo Alto and other excavated Chaco Canyon sites were even lower in total quantity.

Renfrew, Dixon, and Cann have suggested, with reference to Near Eastern obsidian sources, that small quantities of imported material (under 200 kg) do not necessarily imply a well-organized trading system (Renfrew et al. 1968:330). Assuming, however, that chipped stone material was transported to Chaco Canyon in the most expedient way possible, the amount of contact with the source area can be calculated. Following Tourtellot (1978), the number of "carrier days" was estimated for Washington Pass chert at Pueblo Alto, based on the estimated total mass of material imported, distance to source, and an average maximum work rate for foot porters (45 kg x 20 km per day). The calculations were as follows:

$$\frac{\textit{Mass x Distance}}{45\ kg \times 20\ km} = \textit{Carrier Days}$$

$$\frac{130\ kg \times 80\ km}{45\ kg \times 20\ km} = 11.6$$

Assuming a four-day, one-way trip (20 km per day), less than three trips would have been necessary for the efficient transport of this amount of material from the source; however, Pueblo Alto is only one of 10 large town sites found in Chaco Canyon. As noted previously, Washington Pass chert frequencies at some of these other sites could be as high as 50 percent. But, even doubling the number of trips to six and multiplying by 10 sites still results in only 1.2 trips per year during the 50-year period.

This low volume of import can be compared to import volumes for other artifacts. An estimated 49,270 pots may have been imported from the Chuska Mountains area to Pueblo Alto alone from A.D. 1040 to 1100 (Toll and McKenna 1987:210). Preliminary estimates for Bonito Phase sites indicate that over 150,000 architectural beams may also have been imported during this period (Lekson 1984).

Consumption of Chipped Stone

The volume of chipped stone used per household per year was calculated. Figures on the estimated number of households (defined architecturally), years of occupation, and percent of site excavated, which were used in the calculations, were provided by site excavators (Windes, Truell personal communication, 1981). Only five sites had sufficient information (Table 3.42). For example, at site 29SJ 627, an estimated three households occupied the site for 225 years. The volume of chipped stone recovered archeologically represents an estimated 90 percent of the chipped stone that may have been present at the site and 10 percent of the chipped stone that may have been deposited in the trash mound.

A much higher volume of chipped stone use per household is indicated for Pueblo Alto (29SJ 389, a greathouse) during the period represented by Gallup ceramics (about A.D. 1050 to 1100) than for small-house sites in any period. The quantities involved are small; 0.9 kilograms per household per year for the greathouse site; 0.2 of a kilogram for small-house sites. This would mean that the use-rate for chipped stone at Pueblo Alto is five times as great as that at small-house sites. Larger figures at Pueblo Alto (29SJ 389) may be the result of errors in either the estimated length of occupation, the estimated number of households, or the reliability of the sample. Using the small-house site figures (0.2 kg per year) as a baseline, the quantities of chipped stone found at Pueblo Alto would represent 134 households. Alternatively, the 50-year figure for the period represented by Gallup ceramics may be in error. Again using the small sites figure as a baseline, 335 years would have been required to produce the chipped stone debris at Pueblo Alto with the projected 20 households.

Table 3.42. Volume of chipped stone used per household per year.

Site	Number of Households	Years Occupied	Volume of Chipped Stone/Household/Year (grams)
29SJ 389 (Gallup)	20	50	922.0
29SJ 627 (Not Kiva E)	3	225	161.3
29SJ 629	2	130	166.2
29SJ 633	3	30	222.8
29SJ 724	2	20	375.3

The same process was applied to ceramic data. Site 29SJ 629 averaged eight pots per household per year; site 29SJ 627 averaged 28 pots per household per year; Pueblo Alto (29SJ 389) averaged 102 pots per household per year (Toll 1985). Again, the number of pots used per household per year is considerably higher for Pueblo Alto. Averaging the number of pots at small-house sites as 18 per household per year and using this figure as a baseline, the number of pots at Pueblo Alto represents 113 households. Or, 183 years would have been required to produce the number of pots at Pueblo Alto with 20 households. These figures are comparable to those estimated for chipped stone.

Absolute and relative dating support about a 50-year span for the period represented by Gallup ceramics. Thus, we conclude that occupants of the large sites were either using chipped stone at a far greater rate than those at the small sites, or that there are actually far more people at large sites than are suggested by architecture alone. It has been proposed that Pueblo Alto and its surrounding area may actually have been occupied periodically by large numbers of people (Toll, Windes personal communication, 1982) and this suggestion is supported by chipped stone data.

Differential Access to Chipped Stone at Greathouse and Small-house Sites

As discussed above (see Table 3.15 and discussion of local versus exotic materials above), exotic materials are far more common at Pueblo Alto than at small-house sites. The comparison of greathouse and small-house sites, however, is predicated on the assumption that there are contemporary samples from each site type. While proveniences from both greathouse and small-house sites do fall into the 100-year-temporal-units, they may not be fully contemporaneous within these intervals. The period of most interest is, of course, the Classic Bonito Phase (A.D. 1050 to 1100), associated with Gallup ceramics in Chaco Canyon. This period saw the highest frequencies of exotic chipped stone and it appears that exotic material was obtained preferentially at greathouse sites.

It is possible, however, that the small-house sites within the period A.D. 1020 to 1120 are actually earlier than the excavated greathouses assigned to this span. There may be no temporal overlap between the two site types. Almost all material from this period is from Pueblo Alto (29SJ 389) and 29SJ 627. For the most part, 29SJ 627 dates no later than A.D. 1040 (Truell 1992). Trash from Kiva E at 29SJ 627 contains later material, but Truell suggests that these deposits date to the early A.D. 1100s. Thus, there are no well-dated chipped stone materials from small-house sites from A.D. 1050 to 1100, which is the period of greatest activity at greathouses. This gap in the small-house sequence has been questioned by Windes (1981). Although they may be infrequent, he thinks that Gallup Phase small-house sites do exist in the canyon; none have been excavated by the Chaco Project.

There is evidence that some small-house sites in Chaco Canyon were receiving Washington Pass chert in proportions similar to the large sites. Ceramic data from Bc 362 (29SJ 827) (Voll 1964) indicate that this site is contemporaneous with the Classic Bonito Phase at the large sites (Windes, personal communication). A sample (n=411) of unprovenienced chipped stone material from this site included 23 percent Washington Pass chert; a frequency similar to that found at Pueblo Alto in presumably contemporaneous deposits.

Surface material on the trash mound of another excavated small site (29SJ 839) with Gallup Phase ceramics was examined (Windes, personal communication). A transect across this trash mound identified 15 percent Washington Pass chert; much higher than the percentage of this material found at any recently excavated small-house site.

Based on presently excavated sites, evidence of differential access to exotic material by greathouse and small-house sites is ambiguous. The scant evidence of these two sites, however, indicate that Washington Pass chert may have been more frequent at small-house sites from A.D. 1050 to 1100 than previously thought.

Formal and Technological Evidence for Craft Specialization

The level of socio-political development represented by Chaco Canyon has been questioned (Schelberg 1984). Was Chaco a complex system? Evidence for craft specialization might suggest that Chaco was complex. As the following discussion shows, however, there appears to be little evidence for specialized production of chipped stone.

The development of specialized production might be suggested archeologically by increasing standardization of techniques and resulting forms, by increasing diversity and/or elaboration of standardized forms, by increasingly specific selection of raw materials, and by localized production areas (Rice 1981; Toll 1981; Torrence 1981). Specialized production of certain chipped stone tools has been suggested for Salmon Ruins, a Chacoan site on the San Juan River (Shelley 1980).

Only 500 formal tools (with a total temporal span of 800 years) were recovered from excavated sites. While there are stylistic changes over time in projectile point types (from stemmed- to corner- to side-notched), there does not seem to be an increasing diversity in standardized types (Lekson, Chapter 4 of this volume). But, several unusual tools were recovered at Pueblo Bonito in earlier excavations (Judd 1954), including several very large bifaces and 28 stylistically and technologically unusual projectile points associated with a burial (Room 330, Burial 10), that indicate the presence of at least some skilled craftsmen (Bradley 1979).

The detailed analysis did not suggest an increasingly standardized technology as would be indicated by regularity in flake size or special treatment of cores (see Appendix 3C). Mean flake sizes did not change through time nor did the standard deviation of their statistics. The incidence of prepared platforms on flakes did not increase over time. Increasing frequency of regular core types would be an indication of increasingly standardized technology; however, cores in Chaco Canyon show no such temporal patterning. Bradley (1979) states that the primary technology is "mainly a highly opportunistic flake production..." but that "a great range of craftsmanship is exhibited...." This range in craftsmanship has not been related to temporal trends that could indicate the development of craft specialization.

The best argument for the specific selection of special material could be made for Washington Pass chert at Pueblo Alto (29SJ 389) during the period represented by Gallup ceramics (A.D. 1050 to 1100). But, as discussed above, high percentages of Washington Pass chert may not be specific to either Pueblo Alto or greathouses in general.

Of the eight discoidal cores in the Pueblo Alto trash mound (the main regularized form), half ($n=4$) were Washington Pass chert. This suggests formalization of Washington Pass chert cores. But significance was tested with a chi-square (contrasting discoidal cores with all other core types and Washington Pass chert and all other material types) and the resulting chi-square was not significant at the 0.05 level ($df=1$, $\chi^2=2.84$, $0.5<P<.1$). Tools of Washington Pass chert are infrequent in the canyon ($n=15$, 3.2 percent of the tool collection) and there is no evidence of quantities of Washington Pass chert tools elsewhere in the Chacoan region. This would argue against suggestions of specialized production of tools of this material type for use at other canyon sites or at sites outside the canyon.

Obsidian tools constitute almost one-fifth (18 percent) of all excavated tools. Except for A.D. 1120 to 1220, obsidian flakes are rare. This would argue for the import of finished tools rather than raw material into the canyon and production of these tools at some location other than Chaco Canyon. An area of specialized production of obsidian tools has been suggested for the Baca Locality in the Jemez Mountains during the early Pueblo periods (Winter 1981).

Summary

The analysis of chipped stone in Chaco Canyon emphasized patterns of raw material acquisition. The study focused especially on temporal variability in the sources of exotic material selected for use and in access to exotic chipped stone materials by the inhabitants of greathouse and small-house sites. The study found that while locally available materials (silicified woods, chert, chalcedony, and quartzite) were most often selected for expedient use or for manufacture of chipped stone tools, certain types of exotic materials were imported in some quantity during later time periods. This shift to the use of exotics began during the period A.D. 1020 to 1120 and then decreased during A.D. 1120 to 1320.

Washington Pass chert (a source located in the Chuska Mountains, 80 km from Chaco Canyon) is by far the most common exotic material in the assemblage. Over 25 percent of the total chipped stone assemblage during the period A.D. 1020 to 1120 was Washington Pass chert, but most of that material is from Pueblo Alto, the only greathouse site where the Chaco Project conducted substantial excavations. Small-house sites contained far more modest quantities of Washington Pass chert, suggesting differential access to this source by greathouse and small-house inhabitants. The precise contemporaneity of the sample of greathouse and small-house proveniences excavated by the Chaco Project can, however, be questioned. Supplementary information from small-house sites not excavated by the Chaco Project and from surface examinations of small-house sites—which may be more directly contemporary with the Pueblo Alto excavated material—suggests that small-houses may not have had restricted access to Washington Pass chert.

Other exotic materials (Morrison Formation material, Zuni wood, yellow-brown spotted chert, and obsidian) were found in low frequencies throughout the Chaco occupation. Obsidian showed an especially interesting temporal pattern. During early time periods, obsidian seemed to arrive in Chaco Canyon primarily as finished tools, especially projectile points. During the period from A.D. 1120 to 1220—especially at Pueblo Alto—Jemez obsidian (a source located almost 100 km east of Chaco Canyon), is apparently imported in unfinished form, as many pieces of debitage have been recovered from proveniences dating to this time period.

The technology represented by chipped stone at Chaco Canyon is primarily expedient, although a few very elaborately made tools have been found there. Formal tools make up less than 2 percent of the assemblage and unmodified or minimally retouched flakes were the most common form in which chipped stone was used. Cores were primarily irregular in form, another indication of a simple technology. Cores of exotic material (a small percentage of all cores) tended to be smaller and had a lower frequency of cortex than cores of local materials, suggesting that cores of exotic material may have been more fully used before discard at the site.

By far the majority of informal tools were fashioned from local materials, but it appears that when exotic materials were available, they were preferentially selected for use as informal tools. Formal tools of exotic material were also much more frequent than would be expected from the relative frequencies of these materials in debitage and several rare material types were represented only in formal tool forms. Clearly, some tools were arriving in Chaco Canyon in finished form.

There was a significant association of some formal tool types and some material types. For example, arrow points and large point/knives were frequently made of obsidian, while drills were generally made of local material (most drills were fairly informal, however). Greathouses and small-houses contained different proportions of formal tools. Formal tools recovered from greathouses are primarily projectile points while tools at small-house sites are a variety of types (including projectile points). This distribution suggests a more restricted set of activities at greathouses. Formal tools, especially projectile points, were found most frequently in primary contexts (such as floors and roofs), and in these contexts, they tended to be whole rather than broken. These proveniences were presumably their location of storage. Drills were found most frequently in trash fill, possibly because of the expedient nature of this tool type, which would be readily discarded after use.

In an effort to provide broad comparative data across sites in Chaco Canyon, the time-space matrix was used to construct spatial-temporal assemblages of chipped stone that cross-cut sites. These assemblages were then grouped based on similarities in material types and artifact types. The classification of

assemblages based on material type indicated that the greatest source of variability among these assemblages was temporal, although some variability was caused by differences in site type (greathouses versus small-houses). Artifact type assemblages did not show such clearly defined differences. Most of the variability among artifact type assemblages could be attributed to laboratory or field techniques or the vagaries of small sample sizes.

Chipped stone provided information useful for evaluating the role of Chaco Canyon in a regional system. Along with other artifact types, chipped stone indicates that Chaco Canyon had a special relationship with the Chuska Mountains. Based on the distance to the source and normal linear fall-off values, there was far more Washington Pass chert in Chaco Canyon than would be expected. The same was true of Chuskan ceramics, although the volume of ceramic import was far greater than for Washington Pass chert. Washington Pass chert does not appear to have been redistributed from Chaco Canyon, however, except to a few of the Chacoan outliers closest to the canyon. Inside the canyon, Pueblo Alto appears to have consumed far more chipped stone than small-house sites, suggesting a larger population at Pueblo Alto than would be indicated by architecture—possibly a seasonal gathering of the surrounding population. Yet, chipped stone does not provide good evidence of a complex social or political system in Chaco Canyon. The quantity of exotic chipped stone of all types is small and does not suggest large-scale trade, nor is there any evidence that chipped stone production is the result of craft specialization. Even a seeming difference in access to exotic chipped stone between greathouse and small-house sites may be a result of the sample of proveniences excavated by the Chaco Project.

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Appendix 3A

Petrographic Description and Sources of Chipped Stone Artifacts in Chaco Canyon

David W. Love

Introduction

Nearly 35,000 chipped stone artifacts were recovered by the National Park Service during recent investigations of archeological sites in Chaco Canyon. The frequency of different varieties of siliceous rock types used to produce artifacts suggested that some rocks were specifically selected for tools and that some rock types may have come from non-local sources. The purposes of this report are to describe rock types, to locate possible local sources of chippable stone in the vicinity of Chaco Canyon, and to locate sources of non-local varieties of chipped stone artifacts found in sites in Chaco Canyon.

Procedures

The rock types of chipped stone artifacts recovered by the Chaco Project were classified and counted according to the four-digit lithic code developed by Warren (1967, 1979). The lithic types found in sites in Chaco Canyon are described in Appendix 3B. The frequencies of lithic types from Chaco Canyon are shown in Table 3A.1.

Geological investigations of deposits and evolution of the landscape surrounding Chaco Canyon indicated likely local sources of siliceous rocks suitable for artifact manufacture. An outline of the history of the area is presented below to show that properties of geological units are useful in predicting locations of different rock types. Some of the possible local sources were checked in the field. Pebble counts were made by removing all visible pebbles greater than 2 cm long in 1-x-l-m, 2-x-2-m, or 1-x-4-m areas, where pebbles were abundant at the surface. The size of the area depended on the number of pebbles recovered and on the overall abundance of pebbles at the locality. Where possible, at least 300 pebbles were counted within a designated area to decrease statistical errors. At Locality 1, pebbles were counted in a 10 cm square grid (Figure 3A.2). Initially, size, lithic code, type of cortex, type of fracture, origin, and frequency (Table 3A.2) were recorded on computer data sheets for each locality. It became apparent that not all rock types recovered fit into the lithic code, so more generalized types in the code were used as rock type categories.

Depositional History and Landscape Evolution in the Area Adjacent to Chaco Canyon

Chaco Canyon is within the San Juan physiographic and structural basin of the Colorado Plateau. The bedrock exposed in and adjacent to Chaco Canyon consists primarily of Upper Cretaceous and Lower Tertiary sandstone and mudstone, which dip into the center of the San Juan Basin to the northeast (Figures 3A.1 and 3A.2). The oldest unit exposed in and immediately southwest of Chaco Canyon is the Menefee Formation. The Menefee Formation, consisting of lenticular fine-grained sandstone, shale, lignite, coal, and ash beds, represents a delta plain close to sea level. Streams contributing to the delta plain flowed from distant mountains to the southwest in Arizona. The overlying Cliff House Sandstone consists of fine-grained sandstone and shale. The sandstone represents an ancient barrier beach and offshore sandbars deposited approximately 77 million years ago (Donselaar 1989; Mytton and Schneider 1987; Scott et al. 1984; Siemers and King 1974). The shoreline moved southwestward across the delta plain, depositing marine clay, which formed the Lewis Shale above the Cliff House Sandstone. The sea retreated to the northeast and fine-grained

Table 3A.1. Frequency of material types in Chaco Canyon chipped stone collections.

Material Type Code No.	Material Type	Frequency
1010	Miscellaneous fossiliferous chert	373
1011	Fossiliferous chert, San Juan County	117
1012	Fossiliferous chert, Rio Grande gravel	1
1014	Varicolored fossiliferous chert	33
1017	Fossiliferous chert with no banding	3
1020	Miscellaneous chert	14
1021	Granular chert, Nacimiento Formation	60
1022	Pastel-colored chert with quartz grains	10
1024	Distinctive chert	1
1030	Miscellaneous black chert	39
1031	Nearly black chalcedonic chert	1
1035	Black, partially silicified shale	3
1040	Chert and silicified clastic rocks of Morrison Formation	353
1041	Chert and silicified clastic rocks of Morrison Formation but pink dominant	2
1042	Purplish-red or gray argilliceous chert or opal	11
1044	Resembles 1040	5
1045	Uniformly green chert	2
1050	Miscellaneous white chert	277
1051	White chert with mossy black inclusions	35
1052	Clear translucent chalcedony	653
1053	Chalcedony with black inclusions	1,119
1054	Miscellaneous chalcedony and chert	211
1055	Miscellaneous white chert with quartz inclusions	8
1060	Miscellaneous dark red jasper	107
1061	Dark red chert (jasper)	3
1070	Yellowish-brown chert	136
1071	Peloidal ("oolitic") yellow-brown chert (jasper)	5
1072	Yellow-brown chert (jasper with mossy black inclusions)	273
1073	Darkish, yellow-brown chert, Cochiti and Zia	2
1075	Miscellaneous dark brown chert	4
1080	Washington Pass chert	1,344
1081	Pink chalcedonic chert	33
1090	Pedernal chert	10
1091	Pedernal chert (chalcedony)	2
1098	Chert chalcedonic, similar to 1091	1
1100	Miscellaneous silicified wood	26

Table 3A.1. (continued)

Material Type Code No.	Material Type	Frequency
1105	Miscellaneous silicified wood with quartz crystals	1
1109	Light-colored splintery wood	37
1110	Dark brown to gray splintery wood	1,083
1111	Wood from Nacimiento Formation	41
1112	Dark cherty wood (non-chalcedonic)	2,419
1113	Light-colored cherty wood	1,593
1114	Silicified wood, light colors, variegated cherty	1
1120	Red-colored silicified wood	310
1130	Silicified palm wood with vascular rays	180
1131	Silicified wood	1
1140	Light-colored to white chalcedonic silicified wood	2,254
1141	Similar to 1140 with black inclusions	202
1142	Similar to 1140 with more streaks of color	1,109
1143	Silicified wood from Tesuque Formation	2
1144	Silicified wood from south of Zuni	6
1145	Similar to 1140, but dark colors	708
1150	Yellow-brown silicified (jasperized) wood	421
1151	Yellow-brown silicified (jasperized) wood	12
1152	Yellow-brown silicified wood from San Miguel County	3
1153	Silicified wood	6
1160	Colored chalcedonic wood from Chinle Formation	154
1161	Cherty rather than chalcedonic variety of 1160	7
1170	Opalized wood	5
1200	Miscellaneous chalcedony with white inclusions	5
1201	Miscellaneous chalcedony with red inclusions	4
1210	Miscellaneous chalcedony with mossy (? black) inclusions	13
1211	Chalcedony with green inclusions, Cochiti area	1
1212	Chalcedony with red and yellow inclusions, Cochiti area	2
1213	Banded white, yellow or brown chalcedony, Cochiti area	2
1214	Clear, colorless or pink and flesh-colored chalcedony with milky-white inclusions, Zia and Jemez area	5
1215	Clear chalcedony with white and black inclusions, Jemez and Llano de Albuquerque	1
1220	Colorless translucent chalcedony with scattered yellow mossy inclusions	13
1221	Colorless translucent chalcedony with abundant yellow mossy inclusions	42
1230	Colorless translucent chalcedony with sparse red inclusions	81
1231	Colorless translucent chalcedony with abundant red inclusions	26
1232	Clear, colorless, translucent chalcedony with scattered red and yellow inclusions	14

Table 3A.1. (continued)

Material Type Code No.	Material Type	Frequency
1233	Colorless translucent chalcedony with abundant yellow and red inclusions	5
1234	Colorless translucent chalcedony with red and black inclusions	29
1235	Colorless translucent chalcedony with reddish-purple inclusions	5
1240	Colorless translucent chalcedony with brownish-purple inclusions	1
1300	Chalcedony, miscellaneous clear, colored uniformly	5
1310	Chalcedony, clear uniform shades of yellow	15
1315	Chalcedony, clear uniform shades of orange	1
1320	Chalcedony, clear uniform shades of pink or red	26
1330	Chalcedony, clear uniform shades of light gray	4
1340	Chalcedony, clear uniform shades of light brown	3
1345	Chalcedony, clear uniform shades of dark brown	2
1400	Chert, undifferentiated	101
1411	Resembles Alibates chert (Yeso?)	1
1430	Chalcedony, Morrison Formation near Laguna	11
1431	Chert and chalcedony, Waldo, NM. Mottled red and gray	1
1435	Chert cream to orange and red, waxy	3
1550	Dark-colored peloidal chert	3
1551	Chert, "oolitic" dark brown, high surface	2
1570	Chert, breccia cemented with silica	1
1600	Chert, light gray	58
1610	Chert, dark gray	31
1620	Chert, light yellow	2
1630	Chert, cream-colored	5
1640	Chert, light orange	2
1650	Chert, olive, olive green, olive gray	2
1651	Chert, olive gray, ranges to red and brown with quartz	1
1660	Chert, light tan to buff	37
1661	Chert, pebbles, mottled, light brown	6
1662	Chert pebbles, mottled, polished mottled to yellow	1
1680	Chert, pink, miscellaneous	2
2000	Sandstone, undifferentiated	126
2010	Sandstone, fine-grained, indurated, massive, undifferentiated	1
2020	Sandstone, fine-grained, indurated, slabby, undifferentiated	1
2091	Sandstone, limonited, undifferentiated	2
2093	Sandstone, magnetitic, undifferentiated	1
2200	Miscellaneous, silicified quartzose sandstone	84

Table 3A.1. (continued)

Material Type Code No.	Material Type	Frequency
2201	Silicified clastic sediment of Brushy Basin Member	1
2202	Silicified fine-grained brown concretion	362
2204	Quartzitic sandstone, red, dark	3
2205	Silicified fine-grained quartzose, sandstone	26
2209	Quartzitic sandstone	1
2220	Quartzitic sandstone, coarse-grained, red	1
2221	Silicified fine-grained quartzose sandstone	70
2250	Siltsone, undifferentiated	2
2252	Siltstone, mudstone, sandstone, white, pink, thin slabby	1
2261	Siltstone, dark green, Morrison Formation	1
2500	Clay, undifferentiated	3
2550	Claystone, undifferentiated	7
2551	Claystone, baked clays, and shales	17
2552	Baked claystone and shale	1
2600	Mudstone, undifferentiated	1
2650	Shale, undifferentiated	8
2651	Shale, lower Mancos Shale	11
2700	Limestone, undifferentiated	18
2710	Limestone, fossiliferous	2
2919	Concretion	1
3015	Felsophyre (rhyolite)	1
3050	Basalt	1
3100	Granite, undifferentiated	2
3150	Rhyolite, undifferentiated	1
3300	Andesite, undifferentiated	3
3410	Basalt, fine-grained, indurated	1
3500	Obsidian	2
3501	Obsidian, undifferentiated, clear, dark bands, vesicles	1
3502	Obsidian, undifferentiated, clear, dark bands, with black lines or streaks	1
3510	Obsidian, black, near opaque, Grants Ridge	23
3520	Obsidian, clear with brown tinges, Jemez Mountains	237
3523	Obsidian, near opaque with brown color on thin edges, Jemez Mountains	4
3525	Obsidian, gray with white spherulitic inclusions, Jemez Mountains	39
3526	Obsidian, green, banded, Jemez Mountains	2
3530	Obsidian, smoky-gray with fine white inclusions, black dust, Polvadera Peak	43
3540	Obsidian, Mule Creek	8

Table 3A.1. (continued)

Material Type Code No.	Material Type	Frequency
3550	Obsidian	108
3560	Obsidian	4
3601	Obsidian, San Francisco volcanic field, AZ	24
3602	Obsidian, Superior, AZ	3
3603	Obsidian	19
3604	Obsidian	3
3700	Vitrophyre, black, dense	4
4000	Quartzite, undifferentiated	545
4001	Quartzite, white, coarsely crystalline, Rio Grande axial gravels	1
4005	Quartzite, miscellaneous cobbles	313
4009	Quartzite	1
4010	Quartzite, very fine-grained, silt-sized	3
4053	Quartzite	1
4060	Quartzite, very fine-grained, dark red	1
4250	Slate	1
4351	Hornfels, light green, siliceous, San Pedro Mountains	3
4353	Hornfels, banded gray, altered Mancos Shale, Cerrillos	12
4370	Metarhyolite, light-colored	1
4375	Metasyenite, metaandesite	7
4380	Metabasalt	2
4525	Greenstone, massive	4
5000	Quartz, crystalline	1
5002	Rose quartz	2
5010	Quartz, rock, colorless	34
5100	Limonite, dark brown, massive	2
5700		2

Table 3A.2 Lithologic types for localities near Chaco Canyon.

Locality Number	Location	Sizes	Major Lithologic Type (Code Types in parentheses if determined): Local Sandstone and Concretions	All Foreign	Petrified Wood
1 A	Gravel Quarry	All	98	2	
B	(Terrace Gravel)	All	159	1	
C		All	Approx. 6,400	5	
2	Shabik'eshchee (Terrace Gravel)	All	Not counted	173	27
		1			
		2		133	20
		3 None		40	7
3	Shabik'eshchee	All	Not counted	134	19
		1		110	16
		2		24	3
		3 None			
4	4.1 Km northwest of Pueblo Pintado (gravel terrace)	All	141 (37:2000)	802	63
		1	25	654	49
		2	9 (7:2000)	148	14
		3			
5	Same	All		147	8
		1	168 (140:2000; 28:2910)	113	
		2	61 (59:2000)	20	4
		3	27 (26:2000)	14	4
6	0.5 Km North of Peñasco Blanco (gravel terrace)	All	572	69	10
		1		46	5
		2		18	4
		3		5	1
7	Same	All		22	5
		1		14	4
		2		8	1
		3		0	
8	Same	All		52	8
		1		22	2
		2		24	3
		3		4	2
		4		2	1(1112)

Table 3A.2. (continued)

Locality Number	Location	Sizes	Major Lithologic Type (Code Types in parentheses if determined): Local Sandstone and Concretions	All Foreign	Petrified Wood
9	Same	All		46	19
		1		33	14
		2		11	4
		3		1	1(1110)
		4		1	
10	Poco Site	All		407	57
		1	21	357	42
		2		50	15
11	Same	All		355	24
		1	6 (2910)	336	18
		2		18	5
		3		1	1
12	Ah-shi-sle-pah Wash (gravel bar in modern channel	All		139	30
		1	103 (8:2551; 40:2910 55:2000)	119	22
		2	31 (8:2910)	19	7
		3	6 (2000)	1	1
13	Same	All		172	18
		1	37 (7:2551 30:2000)	116	8
		2		54	8
		3	19	2	2
14	1 km Southwest of Pierre's Site (gravel terrace)	All		492	34
		1	87	451	28
		2	21 (2000)	38	4
		3	1 (2000)	3	2

Table 3A.2. (continued)

Locality Number	Quartzite and Silicified Sandstone	Chert	Melavolcanics	Quartz	Other	Data Gathering Techniques and Comments
1 A			2(3850)		1053 present but not counted in sample	1 m grid of 10 cm intervals (100 points on sloping gravely surface) counted clast 2 cm nearest to grid point.
B						All gravel 2 cm from 1/4 m.
C						Counted all foreign clast in a 10 m area. Used B above to estimate number of local clasts.
2	74	58	4	10		2-x-2 m square. Local sandstone and concretions not counted, 2 flakes found.
	52	49	3 (2:4370)	9 (5011)		
	22	9	1 (4370)	1 (5011)		
3	66	37	2	6	1	2-x-2 m square. Local sandstone and concretions not counted. 3 flakes found.
	50	33	2	6 (5011)	1	
	16	4				
4	478	249	1	10	1	2-x-2 m square. All pebbles 2 cm counted. 4 flakes found.
	370	223	1	10 (5011)	1 (3100)	
	108	26				
5	73	43	6		17	1-x-1 m square. All pebbles 2 cm counted.
	47	39	(4370)		17	
	13	3				
	13	1				
6	35	19		2	3	2-x-2 m square. All non-local pebbles. Counted 1/4 m^2. All local casts counted.
	18	18		2	3	
	14					
	3	17				
7	14	2			1	2-x-2 m square. All non-local pebbles counted.
		2 (1070)				
	7				1 (2200)	
	7					

Table 3A.2. (continued)

Locality Number	Quartzite and Silicified Sandstone	Chert	Melavolcanics	Quartz	Other	Data Gathering Techniques and Comments
8	28	10		3	2	2-x-2-m square. All non-local pebbles counted.
	10	6		2	1	
	16	4		1	1	
	1					
	1					
9	11	10		4	1	2-x-2-m square. All non-local pebbles counted.
		8				
	6	2		4	1 (2000)	
	5	1 (1053)				
10	129	202	6	11	2	4-x-1-m rectangle, all gravel collected.
	99	198	6	11	1 (3100)	
	30	4			1 (2200)	
11	88	215	5	23		1-x-1-m square. All non-local pebbles collected.
	82	208	5	23		
	6	7				
12	37	65	7			All pebbles collected.
	31	60	6			
	6	5	1			
13	69	75	8	2		All pebbles collected.
	43	58	5			
	26	17	3			
14	80	273	84	16	5	All pebbles collected.
	69	273	70	6	5	
	10		14	10		
	1					

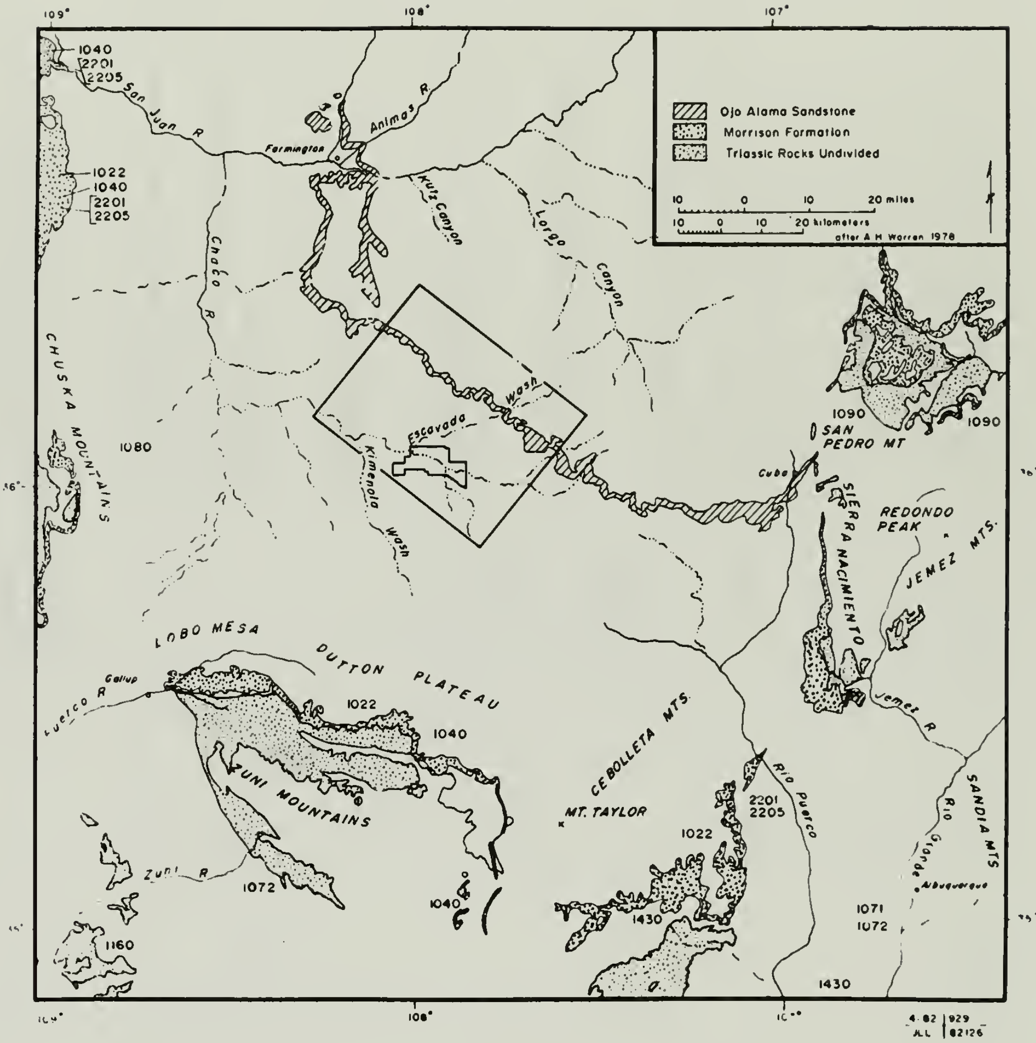

Figure 3A.1 *Sources of chipped stone exotic to Chaco Canyon. A blow-up of the Chaco area (rectangle in approximate center) is shown in Figure 3A.2.*

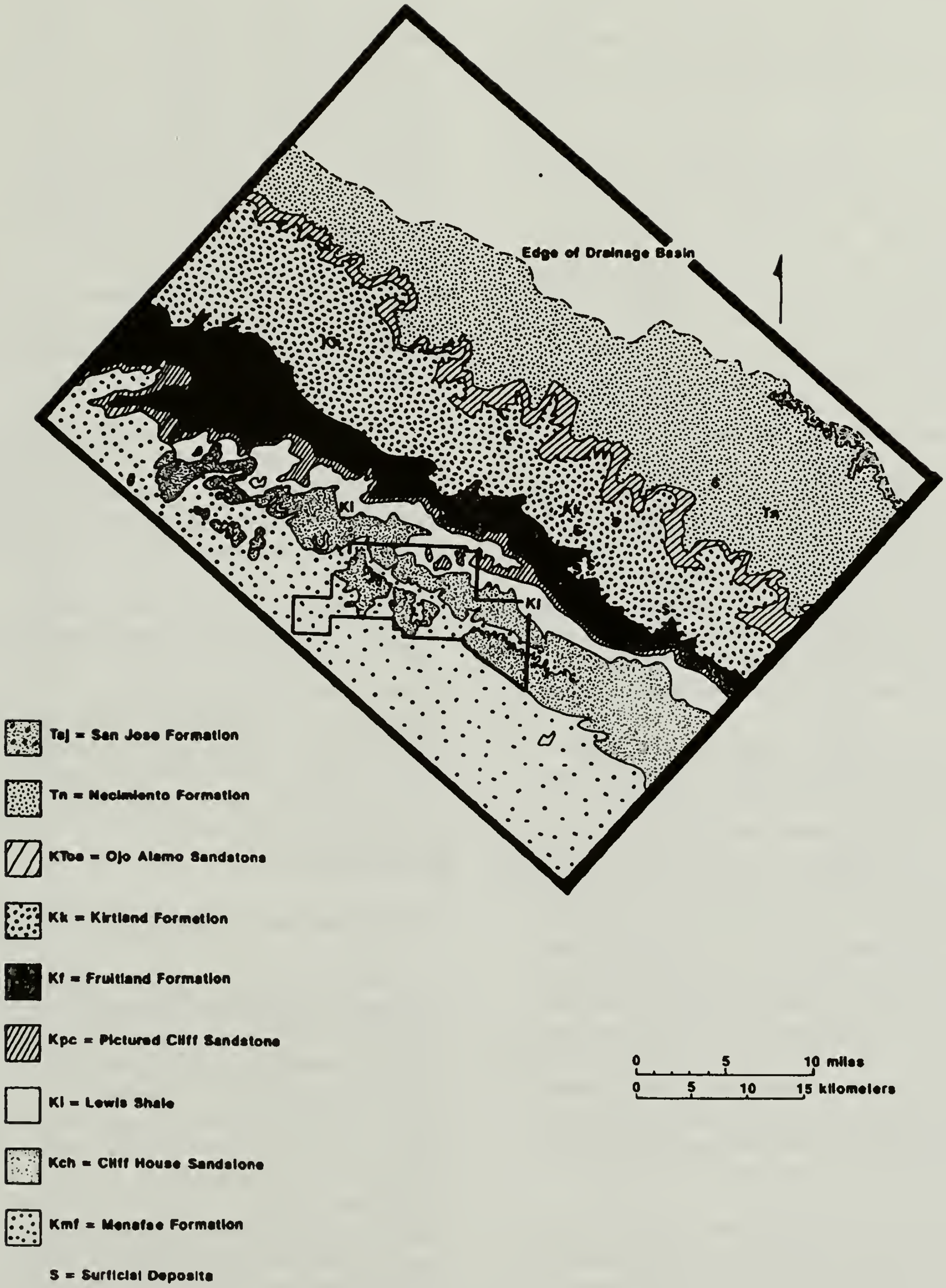

Figure 3A.2 *Local sources of chipped stone. The boundaries of Chaco Culture National Historic Park are outlined in lower third of map.*

shoreface sand was deposited above the muds of the Lewis Shale to form the Pictured Cliffs Sandstone. As the sea receded, the delta plain expanded northeastward across the San Juan Basin, depositing lenticular sand, mud, coal, and ash of the Fruitland Formation.

After the sea withdrew from the North American continent, sedimentation in the San Juan Basin continued along broad alluvial plains, depositing the fine sand and clay of the Kirtland Shale. Uplift and deformation of the region in Late Cretaceous and early Tertiary time (beginning about 70 million years ago) caused erosion of part of the Kirtland Shale. Streams from the southwest, and later from the north, deposited coarse sand and gravel of the Farmington Sandstone and the Ojo Alamo Sandstone. As deformation of the San Juan Basin continued, sediments were shed into the basin from the northeast, forming predominantly mudstone and fine-grained sandstone of the Nacimiento Formation and conglomeratic sandstone and mudstone of the San Jose Formation. No bedrock younger than the 50 million-year-old San Jose Formation is preserved near Chaco Canyon. Erosion of bedrock has dominated the San Juan Basin for the past few million years.

Surficial deposits overlying eroded bedrock appear to be less than two million years old (Scott, personal communication 1979), so there is nearly a 50-million-year-gap between preserved deposits in the Chaco area. Mid-Tertiary deposits are preserved around the margins of the San Juan Basin, indicating that the region received sediments and volcaniclastic sediments intermittently. Some of the gravelly sand deposits on high remnants of geomorphic surfaces (described below) contain angular pebbles and cobbles of chalcedony which could be derived from equivalents of the 20-million-year-old Abiquiu Formation (Vazzana 1980; Warren 1974). Because the surficial deposits of the San Juan Basin have not been studied in detail, further data concerning the late Tertiary history of the basin may be discovered.

In less than two million years, Chaco Canyon became incised through the Cliff House Sandstone in a series of episodes of downcutting, followed by periods of partial alluvial infilling of the canyon (Love 1980, 1983; Love and Gillam 1993). Deposits in Chaco Canyon reflect the two types of geomorphic episodes at several levels in the canyon. The first kind of geomorphic condition is energetic, with transport and deposition of coarse sand and gravel in the canyon, resulting in gravel terraces and lag gravels consisting of cobbles of local sandstone, concretions, petrified wood, and siliceous clasts reworked from Ojo Alamo, Nacimiento, and San Jose Formations. The second kind of condition is less energetic but results in transport and deposition of mostly sand and finer alluvium from both the canyon margins and drainage headwaters. Canyon aggradation of the second kind consists of talus, local tributary fans, eolian deposits, and alluvium from the headwaters. Both major kinds of deposits are partially cemented with calcium carbonate.

The most recent period of alluviation to form the present level of the canyon floor probably began about 40,000 years ago. Aggradation of unconsolidated alluvial fill in Chaco Canyon takes place at an average rate of about one meter per thousand years.

As Chaco Canyon was incised, drainages north and south of the canyon also went through alternating periods of erosion and stability. During stable periods, extensive sloping surfaces of low relief formed adjacent to drainages. During periods of accelerated erosion, the drainages incised to deeper levels. Remnants of the sloping geomorphic surfaces are covered with one or more levels of alluvium composed of gravelly sand and are capped with soils and eolian deposits.

Local Sources of Chipped Stone Artifacts

Attributes of deposits of the Chaco area and their possible archeological significance as resources are given in Table 3A.3. Possible major sources for siliceous chipped stone artifacts include cobbles from the Ojo Alamo sandstone, the San Jose Formation, and gravel deposits of terraces and other geomorphic surfaces. Except for minor silicified sandstone in the Nacimiento Formation, none of the bedrock is silicified enough to be a source for quartzite. Local baked shale and clinker are indurated enough to show conchoidal fracture. Some baked shale is opalized and is suitable for making artifacts. Commonly, the local petrified wood (Menefee and Cliff House formations) lacks adequate silicification to be used to manufacture artifacts, but minor amounts of excep-

Table 3A.3. Characteristics and possible archeological significance of geological deposits in the upper Chaco drainage basin.

Age Formation Name	Maximum Size of Primary Grains	Lithification Cementation/Compaction		Secondary Clasts (Abundance in Parentheses)			Archeological Significance as Resources of Material
		Type	Degree	Concretions	Petrified Wood	Other	
Quaternary							
Modern alluvium	4 m (talus)	None	Slight	None			Source of clay, sandy plaster?
Cemented alluvial fill	Most less than 1 mm, rare talus	$CaCo_3$	Complete			Sandstone blocks	Local source of onyx, local source of travertine, building material, possible local source of temper
Gravel terraces and gravelly-sand on geomorphic surfaces	25-cm-x-10 cm (1 m bedrock boulders)	$CaCo_3$	Partial			Conglomeratic blocks (rare)	Possible local source of many lithics (see Table 3A.2) local source of coarse sand for temper
Chert correlative with Pedernal chert (?)		Silicification	Complete			Blocks of chalcedony	Source of 1050, 1055
San Jose Formation	10-cm-x-5 cm(?)	CaD3 clay compaction	Poor-moderate	Iron oxides	Carbonized (common)	Sandstone blocks	Possible local source of siliceous gravel
Tertiary							
Nacimiento Formation	10 cm	Local silicification	Complete	Iron oxides (common)	Carbonized, partially silicified (common)	Quartzite block (rare), reworked Chinle wood and jasper	Nacimiento quartzite (2202), primary silicified wood poor for artifact manufacture, Chinle silicified wood and jasper excellent quality
Ojo Alamo sandstone and Farmington sandstone	As large as 30-cm-x-15 cm	$CaCo_3$ clay	Moderate	Iron oxides (common)	Partially silicified (common)	Conglomeratic sandstone (common)	Local building stone (Pierre's Site) source of most siliceous gravel in Chaco drainage basin. Source of petrified wood (1140) (?), source of reworked petrified wood from Triassic and Jurassic rocks
Kirtland shale	Less than 0.5 mm	Clay compaction	Poor-moderate	Iron oxides (common)	Carbonized (common)		Possible local source of petrified wood and clay

Table 3A.3. (continued)

Age Formation Name	Maximum Size of Primary Grains	Lithification Cementation/Compaction: Type	Lithification Cementation/Compaction: Degree	Secondary Clasts (Abundance in Parentheses): Concretions	Secondary Clasts (Abundance in Parentheses): Petrified Wood	Secondary Clasts (Abundance in Parentheses): Other	Archeological Significance as Resources of Material
Fruitland Formation	Rarely as large as 2 mm, most less than 1 mm	Clay compaction	Poor-moderate	Iron oxides (common)	Carbonized (common), partially silicified (common)		Possible local source of red baked shale ("Red Dog"), yellow (jarosite, limonite) and red (hematite) pigments, jet, gypsum, montmorillion clay, coarse sand grains with volcanic plagioclase and volcanic rock fragments for temper
Cretaceous							
Pictured Cliffs sandstone	Less than 0.5 mm	Kaolinite clay in interstices	Poor-moderate	Iron oxides (common)	None	Ophlomorpha and other trace fossils (common)	Building stone (Poco Site)
Lewis shale	Less than 0.1 mm	Clay compaction	Poor-moderate	Calcium, iron carbonate (common)	None		Possible source of clay, calcite from concretions, hematite, gypsum
Cliff House sandstone	Less than 0.5 mm	$CaCO_3$, kaolinite clay in interstices	Moderate	Calcite, iron oxides (locally common)	Partially replaced with iron oxides (uncommon)	Cemented Ophlomorpha fossil shells teeth, bones (rare-common)	Local source for jarosite, limonite, hematite, gypsum, montmorillionite clay (Gallo Canyon prospect), building stone, manos and metates
Menefee Formation	Less than 1 mm	$CaCO_3$, Clay compaction	Poor-moderate	Iron oxides (common)	Carbonized, partially silicified (common)	Sandstone blocks (common)	Possible local source of red baked shale ("Red Dog"), jarosite and limonite, hematite pigments, possible local source of jet, gypsum, montmorillionite clay, sandstone beds too fine-grained for temper (?)

tional petrified wood occur locally. Petrified wood suitable for artifacts could possibly be derived from all of the formations, but wood is most abundant in the Fruitland, Kirtland, and Ojo Alamo Formations and in surficial deposits derived from these units. The majority of these deposits occur north of Chaco Canyon. Because no immediate sources of siliceous rock are apparent south of Chaco Canyon (other than baked shale and possibly petrified wood), no reconnaissance was carried out to the south.

Locations investigated as possible local sources of chipped stone artifacts are shown in Figure 3A.1. Summaries of lithological types of pebbles and cobbles found at each locality are given in Table 3A.2. The differences in pebble lithologies between localities may be due to differences in source area, differences in weathering of local rocks, and to possible prehistoric collection of rocks as raw material for chipped stone artifacts. The ratios of amounts of quartzite, chert, metavolcanics, and quartz differ from northwest to southeast across the area, and may reflect differences in sources of pebbles in the Ojo Alamo Sandstone.

The bulk of locally available rock types and petrified wood does not correspond to the frequencies of chipped stone artifacts in sites in Chaco Canyon. Quartzite was not used extensively in spite of its local abundance. Few cherts found in local gravel deposits are suitable for manufacture of artifacts and the majority of pebbles could only be used to produce small flakes and cores. Angular blocks of chalcedony (material type 1050) do not commonly yield flakes consistently. The majority of petrified wood in local gravel is poorly silicified and produces splinters rather than workable flakes. The major exception is chalcedonic wood (material type 1140).

Some localities in the area (Figure 3A.2, S's) were surveyed to identify possible sources of chalcedonic petrified wood (1140) and gray chalcedony (1050). As reported by Warren (1979, personal communication) and Truell (1979, personal communication), large chunks of petrified wood (1140) occur in gravel at the contact between surficial deposits and Cretaceous rocks along the divide between Gallo Wash and Escavada Wash northeast of Chaco Canyon. Silicified wood (1140) is rare except in archeological contexts downstream along Escavada and Gallo Washes. None was found in surficial deposits north of Escavada Wash in similar high-level geomorphic positions.

No logs of chalcedonic petrified wood (1140) have been found in place in Cretaceous or Tertiary formations. Because these wood-bearing gravels rest on Kirtland Shale, the wood must be derived locally from the upper part of the Kirtland Shale, Ojo Alamo Sandstone, or the higher Tertiary formations. Alternatively, the wood has formed in several formations under similar conditions of silicification.

Chalcedony (1050) and related varieties (1051 through 1055) are more widespread in surface gravels than chalcedonic wood (1140), but no source in underlying bedrock has been found. Because some of the chalcedony is similar to Pedernal chert (1090, 1091; Vazzana 1980; Warren 1974), the chalcedony clasts in the surficial deposits could indicate outcrops of Pedernal chert in the San Juan Basin in the past or perhaps transport of clasts westward into the Chaco drainage from the Nacimiento Mountains before the drainage divide shifted westward (Love 1980). Slabs of silicified peloidal ("oolitic") chert (1071?, 1550?, 1551?) and partially silicified limestone are also found as clasts within high-level surficial deposits (Chapman 1977). These clasts could also indicate correlative deposits in the San Juan Basin.

Non-local Sources of Lithics for Chipped Stone Artifacts

Identifiable sources of non-local lithics include silicified rocks of the Morrison Formation, Washington Pass chert, Pedernal chert, Zuni jasper, Chinle wood, and obsidian from the Grants area, the Jemez Mountains, and south of Red Mountain, New Mexico. Some of these sources remain to be described in adequate detail.

Siliceous Rocks of the Morrison Formation

The Morrison Formation is a widespread and complex sedimentary unit which crops out around the margins of the San Juan Basin (Figure 3A.1). Parts of the Morrison Formation and overlying Dakota and/or Burro Canyon Formation are silicified completely, at least locally. Warren (1979) indicated several areas of silicification on the northwestern, south-

ern, and southeastern sides of the San Juan Basin. The upper parts of the Morrison Formation in the Chama Basin northeast of the San Juan Basin are also locally well-silicified (Ridgely 1977). Other outcrops of the Morrison Formation do not exhibit well-silicified beds (Saucier 1967; Green and Pierson 1977).

Silicification of different rock types in the Morrison Formation ranges from none to complete replacement of original grains (Figure 3A.3). Thus, the Morrison Formation furnishes a variety of lithic types (Appendix 3B, Types 1014, 1020, 1022, 1040, 1041, 1044, 1430, 2201, 2205, and 2252). Some outcrops may exhibit the total range in silicification so that source areas may not be distinguishable based on degree of silicification.

The colors of the rocks are commonly determined by the amount and chemical state of iron. If little iron is present, or remains inactive, the colors are commonly pale (Figure 3A.3). If iron is present and is reduced, shades of green are produced. If iron is oxidized, yellow, red, brown, and purple shades result. Probably all shades from light green and yellow to purple occur in the same outcrop area of the Morrison Formation.

Washington Pass Chert

Washington Pass chert (1080, 1081) is found at Narbona Pass (formerly called Washington Pass), located in the Chuska Mountains on the western margin of the San Juan Basin. The chert was first described by Simpson (1850). Warren (1967:122), described the source area:

> The chert is found as nodules and veins in a grayish red (10 R 4/2) vesicular lava (trachyte?) that caps the Washington Pass volcanics... As the volcanic rocks have decomposed, the chert nodules have weathered out and have become residual in the soils of the valley slopes and flats or appear as cobbles in stream gravels.

Pedernal Chert

Outcrops of Pedernal chert (1090) occur in Cerro Pedernal, on the eastern flanks of the San Pedro Mountains and along the crest of the San Pedro and Nacimiento Mountains (Church and Hack 1939; Vazzana 1980; Woodward and Timmer 1979). The chert and chalcedony form one to four layers as much as 4 m thick in the Pedernal Member found in the middle of the Abiquiu Formation. The layers occur as a siliceous caprock directly on the Precambrian crystalline rocks of San Pedro Mountain. Evidence of chert quarries at Cerro Pedernal is described by Warren (1974).

The Pedernal chert formerly covered an extensive area in northern New Mexico. Fragments of chert are reworked into gravel deposits in the surrounding region. As noted above, it is possible that Pedernal chert extended into the San Juan Basin and later contributed loose blocks of chert and chalcedony to the gravelly sand deposits of the high geomorphic surfaces.

Zuni Jasper

Powers (personal communication, 1979), reported sources of tan and red jasper with black mossy "inclusions" (1072, 1973; formerly "Chinle Chert") in the Zuni Mountains. One surface scatter of jasper is located in Sections 21 and 22, T11N, R12W. The bedrock is gneissic granite (Goddard 1966), which cannot produce jasper; therefore, the jasper must have been transported to this locality. The other area is on Oso Ridge, Sections 4 and 5 of T9N, R12W; this ridge is developed in San Andres limestone (Hackman and Olson 1977). Descriptions of the San Andres limestone in the Zuni Mountains (Smith 1954; Hackman and Olson 1977) suggest that it could be the source of 1072. If so, the chert should occur in outcrops on the north side of the Zuni Mountains as well. LeTourneau (in preparation) reported a third area of jasper nodules associated with lower Triassic rocks in the Zuni Mountains. Other lower Triassic outcrops, however, do not contain similar jasper nodules, so the ultimate geologic source of the jasper remains unclear. Nonetheless, these occurrences in the Zuni Mountains provide an adequate archeological location as the source of the material.

Chinle Wood

Chinle wood (1160, 1161) is silicified wood derived from widespread and locally abundant fossil

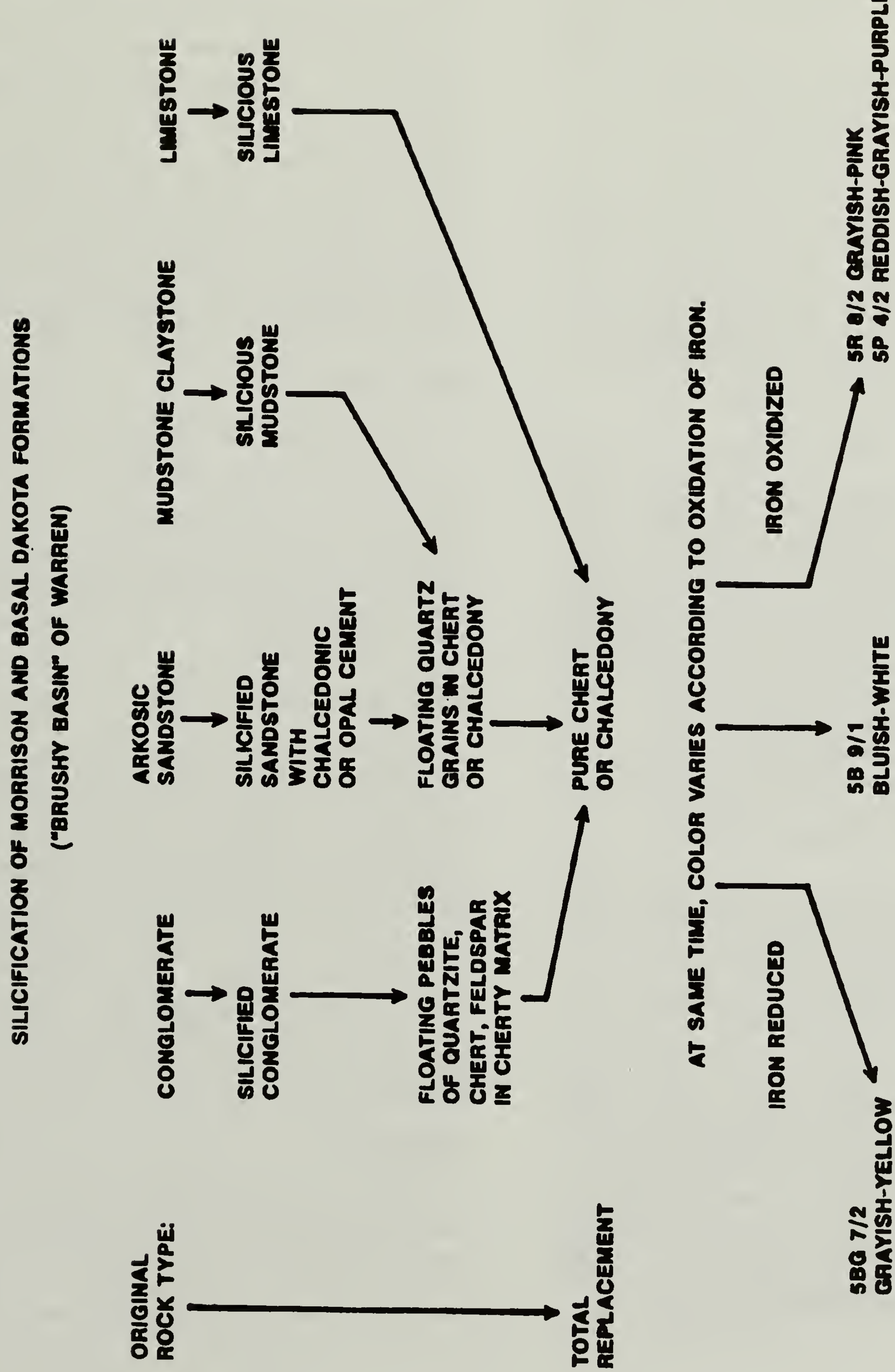

Figure 3A.3. Silicic rock types from the Morrison Formation, New Mexico.

logs in the Chinle Group rocks of Triassic age. The Chinle Group crops out around the margins of the San Juan Basin and in most directions beyond the basin (Heckert and Lucas 1996; Lucas 1993). Chinle wood could be derived from numerous areas in almost any direction. Moreover, Chinle silicified wood is resistant to weathering and is recycled as pebbles and cobbles into conglomerates of later geological formations such as the Tertiary Ojo Alamo, Nacimiento, and San Jose formations, and reworked again into Quarternary gravels from these sources. Ash (1972, 1989) identified more than a dozen species of trees within the Chinle Group, but it is not known whether these species might vary from locality to locality in order to identify where the artifactual wood might have come from.

Grants Obsidian

Grants obsidian (3520, 3511) occurs as clasts within a pumiceous pyroclastic flow exposed on both north and south sides of East Grants Ridge (Thaden et al. 1967). Obsidian clasts also occur in gravel deposits downstream from the flow along the Rio San Jose, Rio Puerco, and Rio Grande. Maximum size of the obsidian clasts is about 10 cm long, but most clasts are less than 4 cm long. As described in Appendix 3B, Grants obsidian is black, nearly opaque, has small white feldspar phenocrysts and crystallites, and has an irregular conchoidal fracture.

Jemez Mountain Obsidians

The Jemez Mountains provide several sources for archeologically important obsidians. Recent work has helped identify at least five distinct sources for obsidian: El Rechuelos (Polvadera), Cerro del Medio, Rabbit Mountain-Obsidian Ridge, Apache tears from the Peralta Tuff and Cochiti Formations, and Cerro Pavo (Baugh and Nelson 1987; Cameron and Sappington 1984; Glascock and Neff 1994; Nelson 1984; Shackley 1988; Smith 1996; Vierra et al. 1993; Wolfman 1994) and more sources may be identified in the future (Wolfman 1994). Other geologically identified obsidians such as the Banco Bonito flow do not have adequate knapping properties and are not known to have been used. The most recent geological information on the Jemez Mountains is contained in articles and road logs of Goff et al. (1966).

El Rechuelos (Polvadera or Polvadera Peak)

Wolfman (1994) indicated that the obsidian commonly termed "Polvadera" does not come from Polvadera Peak, but from small volcanic domes mapped as El Rechuelos rhyolite west of Polvadera Peak. He suggested using the name El Rechuelos for obsidian derived from these domes. Dalrymple et al. (1967) obtained dates of about 2 million years for the domes. The obsidian is almost opaque gray and has numerous microscopic inclusions. Wolfman (1994) found obsidian on the southern two domes, but none on the northernmost dome. Obsidian in gravels continues down Rechuelos and Polvadera Creeks.

Cerro del Medio

Cerro del Medio is a composite rhyolitic dome in the eastern Valles Caldera. Three flow lobes are dated 1.095 to 1.133 million years (Spell and Harrison 1993). Very black obsidian with rare white spherulites occurs on the northern flank of the dome (Gardner et al. 1996; Vierra, personal communication 1996). This dome is a major source for archeological obsidian.

Rabbit Mountain-Obsidian Ridge

Rabbit Mountain is an aphyric rhyolitic dome just beyond the southeast edge of the Valles Caldera and has a radiometric date of 1.43 ± 0.04 million years (Goff et al. 1990; Stix et al. 1988). Collapse of the dome on the southeast side caused a pyroclastic flow that formed the obsidian deposits on Obsidian Ridge. These deposits are a second major source of Jemez obsidian. Wolfman (1994) indicated at least one other dome of similar age and composition (Cerro Toledo) has similar obsidian. Spell et al. (1996) and Gardner and Goff (1996) provide new geochronologic and geochemical information about these domes.

Cerro Pavo

Vierra et al. (1993) mention Cerro Pavo as a source of "black ignimbrite" but its geological description by Singer and Kudo (1986) is a flow banded rhyodactite. Glascock and Neff (1994) analyzed its chemical fingerprint in comparison to

nearby obsidian sources. Smith, Bailey, and Ross (1970) show it as part of Tschicoma Formation domes and flows.

Peralta Tuff-Cochiti Formations

Apache tears are obsidian clasts within the widespread volcanic and volcaniclastic apron named the Peralta Tuff and Cochiti Formations of the southern and southeastern Jemez Mountains (Smith 1996; Smith and Lavine 1996). These deposits range in age from 7 to 3 million years. Most of the Apache tears are less than a few centimeters long and are only suitable for small tools. These Apache tears also are reworked downstream into deposits of the ancestral Rio Grande and are found at least as far south as the central Albuquerque Basin.

Red Hill Obsidian

Red Hill obsidian (3550; the name "Red Hill" should only be used provisionally because the source is not Red Hill) occurs as clasts up to 15 cm long in gravels 10 km south of Red Hill (T2S, R 19 W, parts of Sections 7, 8, 17, 19, 20, and probably in parts of adjacent sections). The source of the obsidian-bearing gravels has not been located, but appears to be southwest. The gravels appear to underlie and overlie basalt flows in the area (Willard and Weber 1958). Presence of primary cortex (cooling fractures and rough vesiculation scars) and lack of chattermarks and abrasion suggests a short distance of transport (a few km at most?). As described in Appendix 3B, Red Hill obsidian is gray to black, very vitreous and ranges from nearly transparent to nearly opaque.

Red Hill Trachyte?

Red Hill trachyte(?) (no lithic code number assigned) occurs in the same gravels as Red Hill Obsidian (3550). The cortex on this dark aphanitic rock (see Appendix 3B for a description) is similar to the cortex on the obsidian, but is even rougher and more vesicular. The fracture is conchoidal so the material is adequate for manufacturing artifacts.

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Appendix 3B

Description of Chaco Project's Lithic Types

Collected by A. Helene Warren

David W. Love

Lithic code numbers were assigned by Warren according to the following general categories:

1000-1999	Chert, chalcedony, and silicified wood,
2000-2999	Sedimentary rocks and fossils except for chert, chalcedony, and petrified wood,
3000-3999	Igneous rocks,
4000-4999	Metamorphic rocks, and
5000-5999	Minerals.

Criteria used to describe the lithic types in hand specimen are:

Texture:	Grain size, range in grain size, or texture of rock or mineral;
Color:	Color or range in color based on hues and chromas of Rock Color Chart Committee (1975);
Luster:	Luster;
Opacity:	Light transmission on the edges (assigned numbers 1 for completely opaque, 5 for clear as window glass);
Fracture:	Types of fracture and surface texture of fracture face;
Cortex:	Cortex type if present; and
Feature:	Distinguishing features to look for on hand specimens.

Description of the types is clustered according to source area where possible.

Sources as Clasts in Ojo Alamo Sandstone, San Jose Formation or Gravel on High Geomorphic Surfaces

1010 Miscellaneous fossiliferous chert

1011 Fossiliferous chert, San Juan County

Texture: Predominantly cryptocrystalline with quartz crystals up to 0.5 mm in diameter replacing fossils and filling linear fractures.

Color: 10YR 7/4, 5P 6/2, 5R 4/6, 10YR 4/2, 10YR 4/2, 10YR 8/2, 5Y 2/1.

Luster: Dull, waxy-like surface of broken paraffin.

Opacity: Translucent, about 2.5.

Fracture: Conchoidal, but hinge fractures common, surface texture is slightly rough; smoother on entirely cryptocrystalline surfaces.

Cortex: Cortex varies from smooth to chattermarked on edges.

Feature: Look for fossils replaced with quartz crystals, cortex, dull waxy luster on fractured surfaces.

1014 Varicolored fossiliferous chert similar to Morrison Formation chert. Distinguished by translucent-white blotches up to 1 mm in diameter. These blotches may be microfossils, oolites or sections of botryoidal chalcedony.

1017 Fossiliferous chert with no banding, but similar to "San Andres Chert" of Zuni Mountains.

1020 Miscellaneous chert with granular texture ranging to quartzite sandstone. No other properties given.

1021 Granular chert from Nacimiento Formation (grades into siliceous sandstone of Nacimiento Formation [2202]).
Texture: Fine-grained granular chert grades into orthoquartzite and silicified siltstone.
Color: 10YR 6/2, 5YR 8/1, N6, N4, irregularly mottled.
Luster: Waxy-vitreous to dull.
Opacity: 1.2.
Fracture: Conchoidal to blocky, granular to smooth surface.
Cortex: Blocky.
Feature: Color and texture (Warren 1967).

1030 Miscellaneous black chert. No other properties given.

1035 Black, partially silicified shale (can be from Mancos shale [Warren, personal communication, 1978], found in gravels or high geomorphic surfaces).
Texture: Very fine-grained microcrystalline.
Color: Dark gray to black.
Luster: Dull.
Opacity: 1.
Fracture: Blocky, fine granular surface.
Cortex: Smooth.
Feature: Commonly does not scratch glass (except local parts of specimen). No streak to gray streak, does not fizz in acid and too soft to be well-silicified.

1050 Miscellaneous white chert (some from Washington Pass, some from gravel in San Juan Basin).
Texture: Cryptocrystalline, fibrous or spherulitic with microcrystalline quartz vugs.
Color: N9, some mottled white with messy or dendritic black inclusions.
Luster: Waxy to dull.
Opacity: 3-4.
Fracture: Conchoidal; smooth surface texture.
Cortex: Smooth polished-white patina.
Feature: Generalized category.

1051 White chert with mossy black inclusions.
Texture: Similar to 1050, microcrystalline quartz in small vugs.
Color: 5B 9/1 with black mossy inclusions.
Luster: Dull waxy.
Opacity: 3-4.
Fracture: Conchoidal, smooth surface texture.
Cortex: White to light yellow-brown patina up to 0.5 mm thick.

1052 Clear translucent chalcedony (found in gravel of high geomorphic surfaces, but may have diverse origins).
Texture: Cryptocrystalline to fibrous.
Color: Clear to translucent; nearly white to light brown.
Luster: Waxy, dull.
Opacity: 4-4.5.
Fracture: Conchoidal, smooth to slightly rough surface texture.
Cortex: Variable patina.
Feature: Generalized category.

1053 Chalcedony with black inclusions.
Texture: Cryptocrystalline-fibrous.
Color: Similar to 1052, but has variable amounts of mossy and vein-like dendritic black inclusions.
Luster: Waxy, shiny.
Opacity: 3-4.
Fracture: Poor conchoidal fracture common.
Cortex: Patina like 1051.
Feature: Miscellaneous category.

1054 Miscellaneous chalcedony and chert similar to 1050-1053. In gravel on high geomorphic surfaces. May have white patina with red and milky-white inclusions.

1061 Dark red chert (jasper) with hematite grains.
Texture: Cryptocrystalline-to-micro-

crystalline with specular hematite grains in veins and disseminated through specimen. Small quartz veins also present.
Color: 5R 2/2.
Luster: Dull.
Opacity: 1.1.
Fracture: Fair conchoidal fracture with rough surface texture.
Cortex: Smooth to chattermarked.
Feature: Color, specular hematite. (Probably derived from Precambrian jasper associated with banded iron formation.)

1070 Yellowish-brown chert (jasper found in gravels of high geomorphic surfaces, but has other sources as well).
Texture: Dense cryptocrystalline with microcrystalline quartz in fossils and vugs; some may be petrified wood (1151).
Color: 10YR 5/6, may be variegated in shades of brown or gray.
Luster: Dull.
Opacity: 1.1.
Fracture: Conchoidal, smooth surface.
Cortex: Variable.
Feature: Miscellaneous type, color diagnostic.

1071 Peloidal ("oolitic") yellow-brown chert (jasper).
Texture: Similar to 1070 but has peloids.
Color: Yellow-brown; fine concentric bands around peloids.

1550 Dark-colored peloidal chert.
Texture: Cryptocrystalline peloidal ("oolitic") chert.
Color: Dark brown or light gray, 5YR 2/1 common.
Luster: Dull.
Opacity: 1.1-3.
Fracture: Conchoidal—hinged conchoidal, slightly rough.
Cortex: Commonly altered to lighter shades on outside.
Feature: Peloidal texture.

2200 Miscellaneous silicified quartzose sandstone. Sand grains stand out on fractured surface and are distinguishable as grains.

2202 Silicified fine-grained brown concretion of Nacimiento Formation (c.f., 1021).

2221 Silicified fine-grained quartzose sandstone.
Texture: Fine-grained uniform texture, large quartz grains are black vugs up to 4 mm.
Color: Dark to medium dark gray (N3-N4, also 7.5YR 6/2), gray streaks.
Luster: Dull, shiny (?).
Opacity: 1.2.
Fracture: Conchoidal to blocky.

Locally Derived Petrified Wood

1109 Light-colored splintery wood.
Texture: Cryptocrystalline-microcrystalline, poorly silicified to nonsilicified wood grain prominent quartz crystals in vugs.
Color: Commonly light tan (10YR 8/2, 10YR 7/4); may have chalcedonic veins through it.
Luster: Dull.
Opacity: 1.1-4.
Fracture: Breaks in slabs and splinters.
Cortex: Variable.
Feature: Light color, splintery fracture.

1110 Dark brown to gray splintery wood.
Texture: Similar to 1109, but darker in color.

1111 Wood from Nacimiento Formation.
Texture: Quartz crystals up to 1 mm long grow long fabric of wood to give granular fabric to wood, otherwise poorly silicified. "Looks sandy." Fine-grained quartz crystals occur in interior.
Color: Typically 5YR 4/2, or 10YR

4/2 with streaked surfaces.
Luster: Dull.
Opacity: 1.2.
Fracture: Blocky to splintery.
Cortex: Variable.
Feature: Granular texture, color, poor fracture.

1112 Dark cherty wood (nonchalcedonic).
Texture: Cryptocrystalline with wood grain visible.
Color: Variety of dark colors (e.g., 5YR 3/4).
Luster: Waxy.
Opacity: 1-2.
Fracture: Conchoidal fracture, smooth surface.
Cortex: Smooth chattermarked.
Feature: Dark colors an conchoidal fracture. (Occurs in gravel on high geomorphic surfaces.)

1113 Light-colored cherty wood.
Texture: Cryptocrystalline with wood grain.
Color: 10YR 7/4 to 5G 8/1.
Luster: Slightly shiny.
Opacity: 2.
Fracture: Excellent conchoidal fracture.
Cortex: Smooth chattermarked pebble surface.
Feature: Light color, wood grain, conchoidal fracture.

1120 Red-colored silicified wood (some varieties occur in local gravels).
Texture: Wood grain with cryptocrystalline silicification, some fibrous chalcedonic.
Color: 5R 4/6, 10R 4/6, 5R 5/4, some black and blue-white streaks.
Luster: Dull, waxy, slightly shiny.
Opacity: 1.5-3.
Fracture: Conchoidal; smooth to finely granular.
Cortex: Variable. Commonly smooth with chattermarks.
Feature: Color and degree of silicification.

1130 Silicified palm wood with vascular rays (locally in gravel).
Texture: Cryptocrystalline, wood texture of vascular rays.
Color: Variable. Light to dark brown, red or yellowish-brown, vascular rays form light and dark streaks.
Luster: Waxy to dull.
Opacity: 2(?) variable.
Fracture: Conchoidal.
Cortex: Smooth and polished pebble surfaces.
Feature: Vascular rays of "palm" wood.

1140 Light-colored to white chalcedonic silicified wood.
Texture: Noncrystalline smooth to cryptocrystalline quartz crystals up to 2 mm long in vugs; wood grain variable to nonexistent.
Color: 5B 7/1, 5B 5/1, 10YR 7/4, streaks, other colors minor.
Luster: Dull, waxy to smooth.
Opacity 3.5.
Fracture: Conchoidal; some platy or splintery along wood grain, smooth to very slightly rough surface.
Cortex: Wood-grain patinated.
Feature: Light chalcedonic wood. (One source is in gravel resting on Cretaceous Fruitland and Kirtland Formations along Escavada-Gallo drainage divide.)

1141 Similar to 1140 with black inclusions.

1142 Similar to 1140 with more streaks of color.

1145 Similar to 1140, but dark colors such as streaks of 10YR 4/2.

1150-1151 Yellow-brown silicified (jasperized) wood.
Texture: Cryptocrystalline with varieties of chalcedony and quartz parallel to wood grain. Wood

grain not universally preserved.
Color: 10YR 6/6, 10YR 5/4 may grade to 5R 3/4 (Type 1120).
Luster: Dull to waxy.
Opacity: 2.
Fracture: Conchoidal to blocky fracture, smooth to striated surface texture.
Cortex: Rough "bark" surface.
Feature: Color, wood texture and conchoidal fracture (source of 1150 not specified, source of 1151 is along lower Chaco River).

1170 Opalized wood (some local varieties.)
Texture: Opaline with wood texture.
Color: All colors.
Luster: Opalescent sheen.
Opacity: 2-4.
Fracture: Conchoidal.
Cortex: Can be patinated.
Feature: Opalescent luster with wood grain.

Derived from Baked Shale and Clinker in Menefee and Fruitland Formations near Chaco Canyon

1042 Purplish-red or gray argillaceous chert or opal associated with baked shale.
Texture: Cryptocrystalline.
Color: 5R 4/6, 10R 5/4, 10R 4/2, 5B 5/1, N8. Colors tend to be concentric around margins of blocks of material with red on outside, gray at center.
Luster: Shiny to waxy to opalescent.
Opacity: 2.
Fracture: Conchoidal to blocky, naturally fractured; surface of fractures smooth.
Cortex: None to irregular contact with baked shale.
Feature: Color, luster, association with baked shale.

2551 Baked claystone and shale.
Texture: Fine-grained silt and clay with fossil casts of leaves and stems forming flattened vugs parallel to bedding planes. May be massive or stratified. Grades to chert.
Color: 10R 6/6 to 4YR 8/4, fossil casts 10R 3/4.
Luster: Dull and earthy.
Opacity: 1.
Fracture: Platy or hackly to conchoidal (uncommon) shrinkage cracks may be present. Curved slickensides present locally.
Cortex: None.
Feature: Color, texture and fracture distinctive.

1014 Varicolored chert (included in list associated with surface gravels in San Juan Basin).

1020 Miscellaneous chert with granular texture ranging to quartzite sandstone. No other properties given.

1022 Pastel-colored cherty with quartz grains floating in it, grading to white-buff, orange to red fine-grained silicified sandstone (2205) at contact with overlying Dakota Formation.

1040 Chert and silicified clastic rocks of Morrison Formation (Brushy Basin Member?).
Texture: Ranges from pure cryptocrystalline chert to chert with microcrystalline pods of quartz, to chert with floating quartz grains, to silicified conglomerate with relict clasts of quartizite, chert, bull quartz and feldspar with a matrix of brecciated chert to green, unsilicified sandstone (all in hand specimen).
Color: Predominately green colors: 5G 7/2, 5G 5/2, also 5Y 8/1, 5GY 4/1, N4, 10R 6/2 10R 5/4, 10YR 5/4 and 5B 9/1. Although single colors (mainly green) predominate, color

banding, liesegang-like banding and mottling with blotches of 5P 4/2 occur.
Luster: Dull, waxy to slightly shiny to unglazed porcelain.
Opacity: 1.5-1.
Fracture: Conchoidal fracture with smooth to rough surface texture.
Cortex: Weathering rind of 10R 6/6, 5R 5/4 or 5R 3/4 patina.
Feature: Green color and variety of rock types.

1041 Similar to above except dominant color is pink. 10R 6/2 - 5R 7/4.

1044 Resembles 1040, but origin cannot be demonstrated to be Brushy Basin Member of Morrison Formation.

1430A Chalcedony from near Laguna from Morrison Formation (?).
Texture: Fibrous cryptocrystalline, vugs and microquartz crystals—1 mm.
Color: Colorless, translucent to 10R 4/6 with blotches.
Luster: Dull, waxy, uncommonly slightly shiny.
Opacity: 3-3.5.
Fracture: Good conchoidal fractures, slightly rough surface, especially over quartz micro crystals.
Cortex: Not known.
Feature: Differs from Pedernal (1090-1091) in surface roughness, size of red blotches (larger than 1091). Otherwise, similar to red Pedernal chert, but very different from colorless Pedernal chalcedony.

1030B Gradational from 1430A, but very different.
Texture: Less chalcedonic, more cherty, vugs more common.
Color: Not colorless, (10R 5/6 or 10R 6/6 between red chert (red is less than half of yellow-brown colors).
Luster: Dull(?).
Opacity: 2.
Fracture: Variable conchoidal fracture.
Cortex: Not given.
Feature: Color and size of fields of color.

2201 Silicified clastic sediment of Brushy Basin Member.
Texture: Chert pebble conglomerate or breccia with sandstone matrix. Some clasts may have been claystone originally. Chert clasts can have sharp or gradational contacts with sandstone matrix with some quartz grains included in chert clasts. Whole rock is well-silicified.
Color: 5YR 3/4, 5Y 7/6, 5R 4/6 and N4.
Luster: Dull to waxy.
Opacity: 2.
Fracture: Conchoidal; surface texture smooth to rough.
Cortex: Unknown, probably similar to 1040.
Feature: Range of grain size and silicification.

2205 Silicified fine-grained quartzose, sandstone.
Texture: Fine-grained quartzose sandstone with minor chert clasts and minor vugs.
Color: White to yellowish-gray 5Y 8/1.
Luster: Dull-shiny.
Opacity: 3.
Fracture: Fair conchoidal fracture.
Cortex: Unknown.
Feature: Texture looks like fine-grained tapioca.

2552 Claystone, Brushy Basin Member.
Texture: Very fine-grained, compact siliceous claystone grading to clayey chert.

Color: Variegated banding with predominant 10YR 7/4. Shades of green are also present.
Luster: Dull.
Opacity: 1.
Fracture: Conchoidal to flaggy?
Cortex: Unknown.
Feature: Fine-grained texture and variegated banding.

Miscellaneous Sources

1055 Miscellaneous white chert with quartz inclusions.

1060 Miscellaneous dark red jasper.
Texture: Specimen as type collection has slightly shiny-waxy luster, good conchoidal fracture with smooth surface; color is 10R 3/4.

1072 Yellow-brown chert (jasper) with mossy black inclusions (source located in Paleozoic rocks near Mount Sedgwick in Zuni Mountains.
Texture: Cryptocrystalline smooth.
Color: 7.5YR 5/6 with black mossy or dendritic inclusions up to 2 mm in diameter.
Luster: Dull with hint of being uncommonly shiny, not waxy. 10R 3/4 (burned?).
Opacity: 1.1.
Fracture: Conchoidal smooth; some blocky (if burned).
Cortex: Variable, commonly rough.
Feature: Color and inclusions.

1073 Darkish yellow-brown chert (known from gravels at Cochiti and Zia Pueblos).
Texture: Cryptocrystalline with brachiopods, microfossils, calcite cleavage fragments, tiny irregular holes near fossils.
Color: 10YR 4/2 with fossils and blotches and mottles of 10YR 5/6.
Luster: Dull to shiny.
Opacity: 2-2.5.
Fracture: Good conchoidal fracture; smooth with rough spots.
Cortex: Shiny smooth with chattermarks on edges.
Feature: Distinguished by color.

1080 Washington Pass chert (chalcedony).
Texture: Cryptocrystalline, rarely brecciated. Fibrous, some opalescent, cavities and vugs present.
Color: 10R 8/2, 10R 6/2, 10R 7/4, 10R 6/6, 10R 4/6, 10R 5/4 and 10R 6/6, 10R 7/4. Color banding and mosaic patterns are common; black dendritic inclusions uncommon.
Luster: Dull waxy to slightly shiny.
Opacity: 3.5-4.5.
Fracture: Excellent conchoidal fracture; surface texture is commonly smooth, rare slightly embossed breccia clasts above rest of surface, some specimens orazid.
Cortex: White opal on surface, hackly surface from growing on calcite crystals in vugs in volcanic rocks.
Feature: Color luster and fracture are diagnostic.

1090-1091 Pedernal chert (1091 chalcedony).
Texture: Cryptocrystalline chert and chalcedony.
Color: White (5B 9/1) chert has mossy inclusions or mottled with borders of 5R 4/6, 10YR 5/4, or N3.
Luster: Dull, waxy to slightly shiny.
Opacity: Chert 3, chalcedonic (1091) 4.
Fracture: Good to excellent conchoidal fracture, smooth to slightly rough.
Cortex: Variable.
Feature: Color and fracture. (References: Bryan 1939; Warren 1974; Vazzana 1980).

1143 Silicified wood from Tesuque Formation. White milky-opal with black inclusions.

1144 Silicified wood found south of Zuni, New Mexico. Pink, orange, and gray (see 1161).

1152 Yellow-brown silicified wood from San Miguel County (Chinle Formation?) and Zuni(?).

1160 Colored chalcedonic wood from Chinle Formation, Arizona.

Texture:	Cryptocrystalline to fibrous.
Color:	Colorless to pastels of yellowish or bluish translucent with streaks of orange, red or purple.
Luster:	Waxy to slightly shiny.
Opacity:	3-4.
Fracture:	Conchoidal, smooth surface.
Cortex:	None.
Feature:	Color and fracture.

1161 (Includes 1144). Cherty rather than chalcedonic variety of 1160, fracture not as good as 1160. Some specimens less silicified, may grade to 1160 across specimen.

1211 Chalcedony with green inclusions from Cochiti area.

1212 Chalcedony with abundant red and yellow inclusions ("moss jasper") from Cochiti area.

1213 Banded white, yellow, or brown chalcedony, with or without black mossy inclusions from Cochiti area.

1214 Clear, colorless or pink and flesh-colored chalcedony with milky-white inclusions from Zia and Jemez area, dull luster, slightly rough surface on conchoidal fracture.

1215 Clear chalcedony with white and black inclusions from Jemez and Llano de Albuquerque.

No Known Source

1031 Nearly black chalcedonic chert. No other properties given.

1045 Uniformly green chalcedony. No other properties given.

1075 Miscellaneous dark brown chert.

1081 Pink chalcedonic chert which resembles 1080 Washington Pass chert.

1100 Miscellaneous silicified wood.

1105 Miscellaneous silicified wood with quartz crystals.

1200 Miscellaneous chalcedony with white inclusions.

1201 Miscellaneous chalcedony with red inclusions.

1210 Miscellaneous chalcedony with mossy (black?) inclusions.

1220 Colorless translucent chalcedony with scattered yellow mossy inclusions; miscellaneous category.

1221 Colorless translucent chalcedony with abundant yellow mossy inclusions; miscellaneous category.

1230 Colorless translucent chalcedony with sparse red inclusions; miscellaneous category.

1231 Colorless translucent chalcedony with abundant red inclusions; miscellaneous category.

1232 Clear, colorless, translucent chalcedony with scattered yellow and red inclusions; miscellaneous category.

1233 Colorless translucent chalcedony with abundant yellow and red inclusions; miscellaneous category ("moss jasper").

1234 Colorless translucent chalcedony with red and black inclusions.

1235 Colorless translucent chalcedony with reddish-purple inclusions ("moss jasper").

1240 Colorless translucent chalcedony with brownish-purple inclusions.

1411 Resembles Alibates chert (Yeso?, New Mexico).
Texture: Cryptocrystalline.
Color: Mottled in irregular bands of creamy and reddish-brown chert (jasper).
Luster: Slightly shiny, more shiny than waxy.
Opacity: 3.5.
Fracture: Excellent conchoidal fracture.
Cortex: Not known.
Feature: 1411 darker reddish-brown with finer mottles than Pedernal chert (1090); also less translucent.

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Appendix 3C

Cores

Catherine M. Cameron

Description of Attributes

Six hundred and thirteen cores were identified in the Chaco collections. The following attributes were recorded for each core:

1. Material type—see Appendix 3A.
2. Weight—to the nearest 0.1 gram.
3. Maximum dimensions—to the nearest 0.1 cm.
4. Amount of cortex:
   0) Cortex absent
   1) 1 - 25%
   2) 26 - 50%
   3) 51 - 75%
   4) 76 - 100%
5. Number of negative scars. All negative scars measuring 2 cm or more in length were counted and recorded. A definitional problem arose here in the identification of "exhausted" cores which may be too small to retain flake scars 2 cm long. Schutt (1981) has pointed out the difficulty of distinguishing exhausted cores from retouched flakes. Her suggestion of the use of consistency of flake scars along an edge perimeter to distinguish the two was used in this analysis.
6. Number of platforms. All flake scars emanating from a single plane were considered to have shared the same platform. Thus, the number of platforms represented by flake scars was recorded.
7. Number of platforms with cortex. This attribute recorded the presence of cortex on the platforms recorded above.
8. Core type. The following core types were recorded:
   1) Irregular core. Flakes removed from several surfaces in any available direction. Shape is blocky.
   2) Discoidal core. Flakes removed in two directions from edges resulting in disc shape.
   3) Polyhedral core: Flakes removed from one platform in a regular fashion resulting in cone-shaped core.
   4) Test core. Piece of raw material with one flake removed.
   5) Other core. A core with a shape and flaking pattern which does not fit into any of the above types.
   6) Wedge-like core. A rectangular piece of material with flakes emanating from both ends resulting in wedge shape.

Material Comparisons

The proportion of materials in cores is generally similar to the proportion of materials in the entire collection (Table 3C.1). There seem, however, to be more cores of cherty silicified wood and high surface chert and fewer cores of chalcedonic silicified wood than would be found in the general collection. This may be the result of the manner in which these two types of material occur. Chalcedonic silicified wood occurs in log form at some distance from Chaco Canyon. Processing large chunks of this material at its point of origin might result in the production of flakes, not cores, which would then have been returned to the canyon. Cherty silicified wood, on the other hand, can be found in gravels in the Chaco area and in-processing might form more readily recognizable cores.

Splintery silicified wood had a very low frequency of cores in relation to its frequency in the rest of the collection. This may be the result of the reuse of cores of this material as hammerstones. The frequency of hammerstones of splintery silicified wood at sites in Chaco Canyon averages about 30 percent of all hammerstones and reaches over 50 percent at some sites.

Dimensions

Core size was measured by weight and a maximum dimension. Figures 3C.1 and 3C.2 plot

Table 3C.1. Material frequency: Cores versus all other chipped stone.

	Cores		All Other Types	
	No.	%	No.	%
Morrison Formation materials	3	0.5	536	1.6
Yellow-brown spotted chert	6	1.0	366	1.1
Washington Pass chert	34	5.7	2,877	8.5
Zuni wood	10	1.7	297	0.9
Obsidian	9	1.5	660	2.0
High surface chert	113	19.1	3,648	10.8
Cherty silicified wood	195	32.9	7,977	23.6
Splintery silicified wood	5	0.8	3,310	9.8
Chalcedonic silicified wood	89	15.0	8,598	25.5
Quartzite	132	2.2	1,375	4.1
Other	116	19.6	4,139	12.3
Totals	593	99.4	33,783	100.2

the distribution of these measurements; both of these figures show a very high upper range. A Pearson's Correlation Coefficient (0.7576, N=613, P=0.0000) showed them to be fairly closely related. Core weights were divided into six groups, as shown in Table 3C.2, and compared with material types. It is clear that patterned variability exists among these groups, although zero cells preclude the use of statistical evaluation. The exotics tend to be very small (except for Morrison Formation materials). Of the local materials, splintery silicified wood (1109-1110), quartzite, and "other" all tend to be large; chalcedonic petrified wood (1140) shows a general tendency to have small cores. Materials were regrouped (all exotics were combined and splintery silicified wood, quartzite, and "other" were combined) to eliminate zero cells and the resulting chi-square statistic was significant at the 0.01 level (χ^2=86.4, df=20, P=0.0000). Table 3C.3 shows mean and standard deviation of the weight and the maximum dimension for each material type. These generally produced the same results as were found above.

Form

Material Variability

It is clear that the cores of all materials are overwhelmingly irregular, but some patterning of form and material is present (Table 3C.4). Wedge cores are almost exclusively silicified wood (primarily 1112, 1113). Obsidian has a greater than expected frequency of test cores and quartzite has a higher than expected frequency of polyhedral and discoidal cores. Core type and material type distributions were then examined eliminating irregular cores. Test cores, wedge cores, and other cores were lumped and material type was regrouped to eliminate zero cells. The data used in this chi-square test are shown in Table 3C.5. It was not significant at the 0.01 level (χ^2=16.8, df=8, P=0.0322) indicating that, in general, specific core types were not the result of variation in material type.

Size and Weight

Table 3C.6 displays mean and standard deviation of maximum dimension and weight for each of these core types. Although standard deviations are high for weight, means seem to be similar, except for test and other cores, which were very low in frequency. The distributions of core types by weight are plotted in Figure 3C.3 with test cores, wedge cores, and other cores lumped. These distributions appear to be very similar, with all types varying from very small to very large. A table of core type against grouped weights is shown in Table 3C.7, with test cores, wedge cores, and other cores lumped. It was not significant at the 0.01 level (χ^2=24.67, df=15, P=0.0545), although several cells had a frequency of less than five, an indication of lack of size variation among core types.

Presence of Cortex

One quarter of all cores showed no cortex, which may be an indication of extensive use,

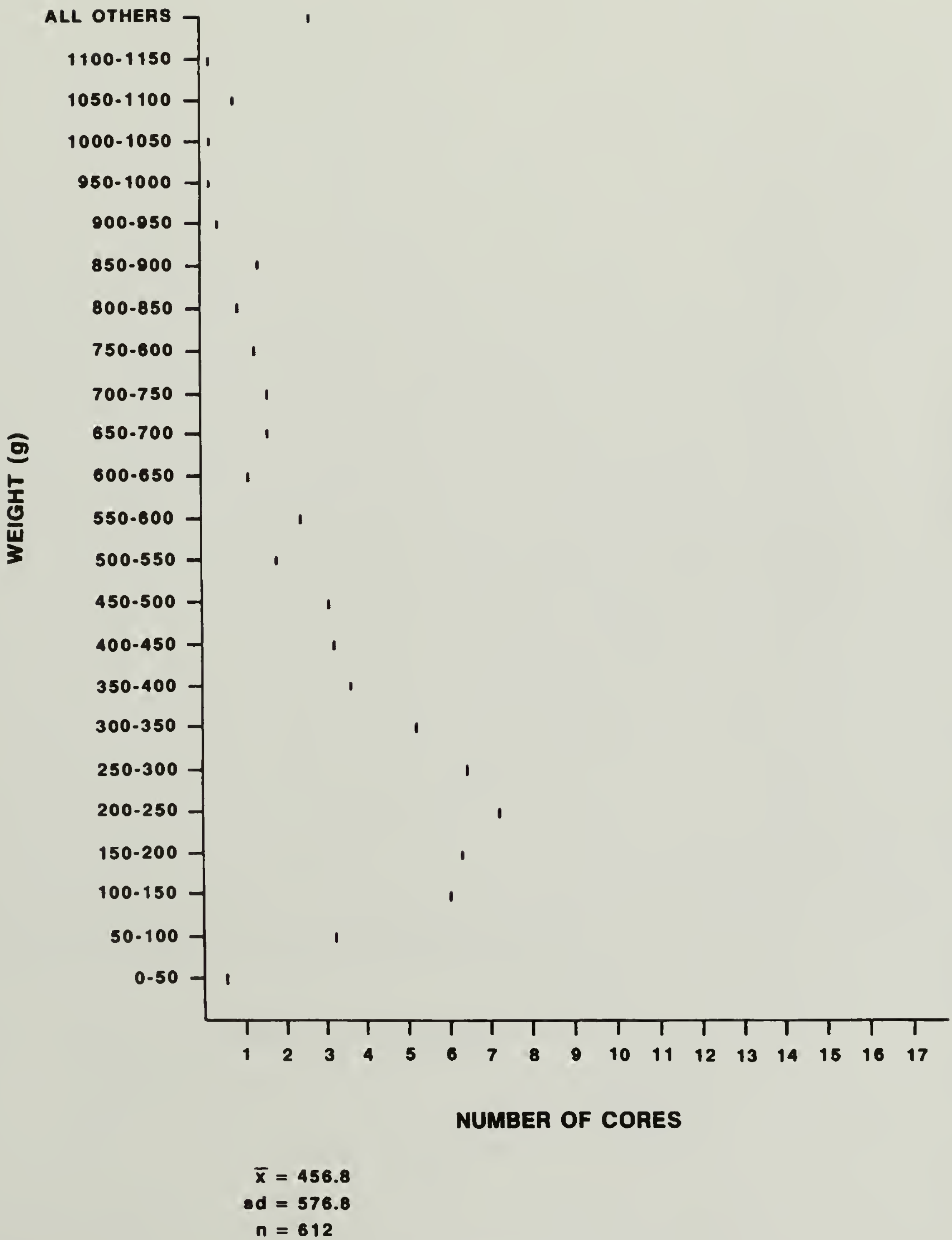

Figure 3C1. *Distribution of core weights.*

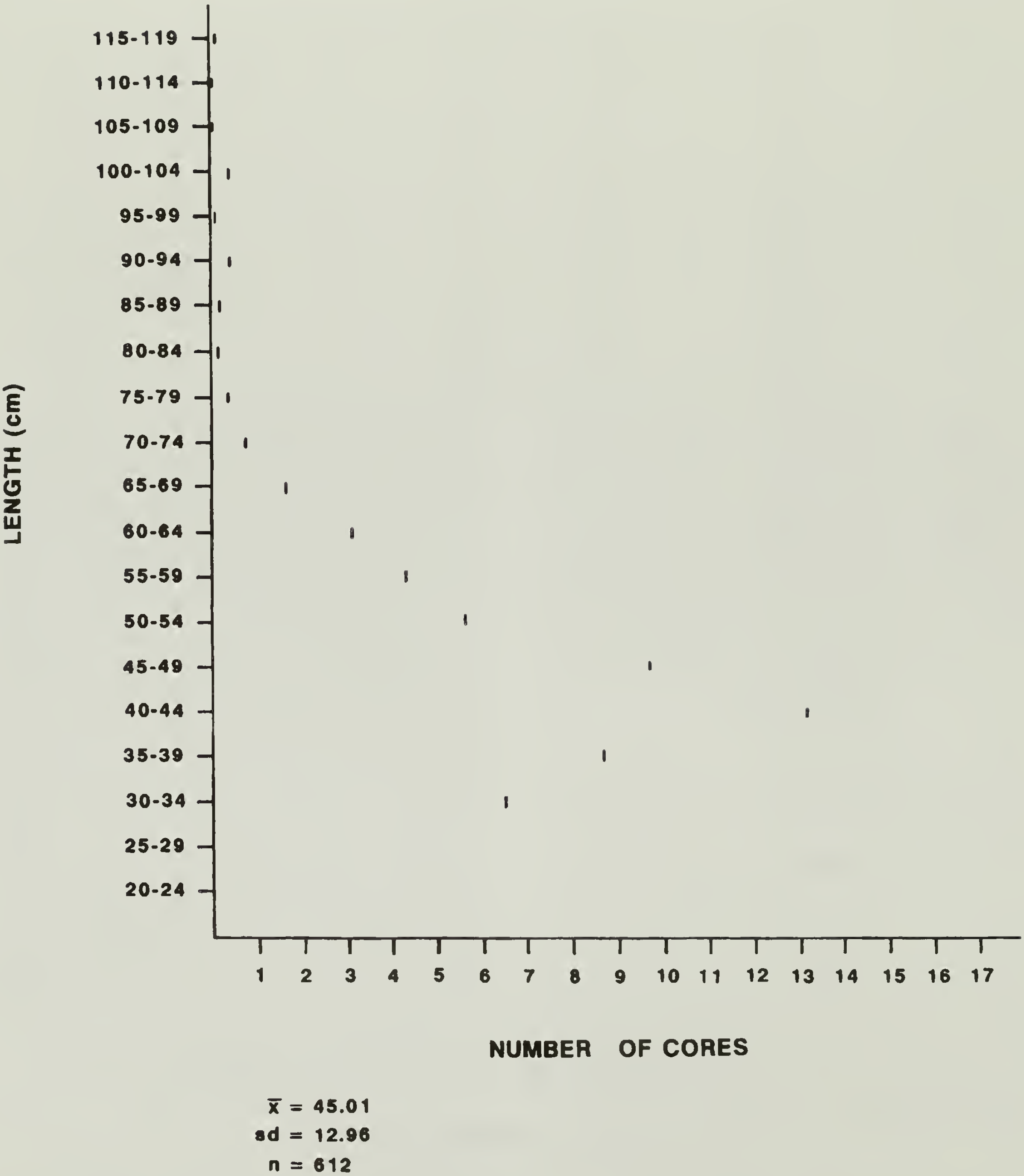

Figure 3C2. Distribution of maximum dimension.

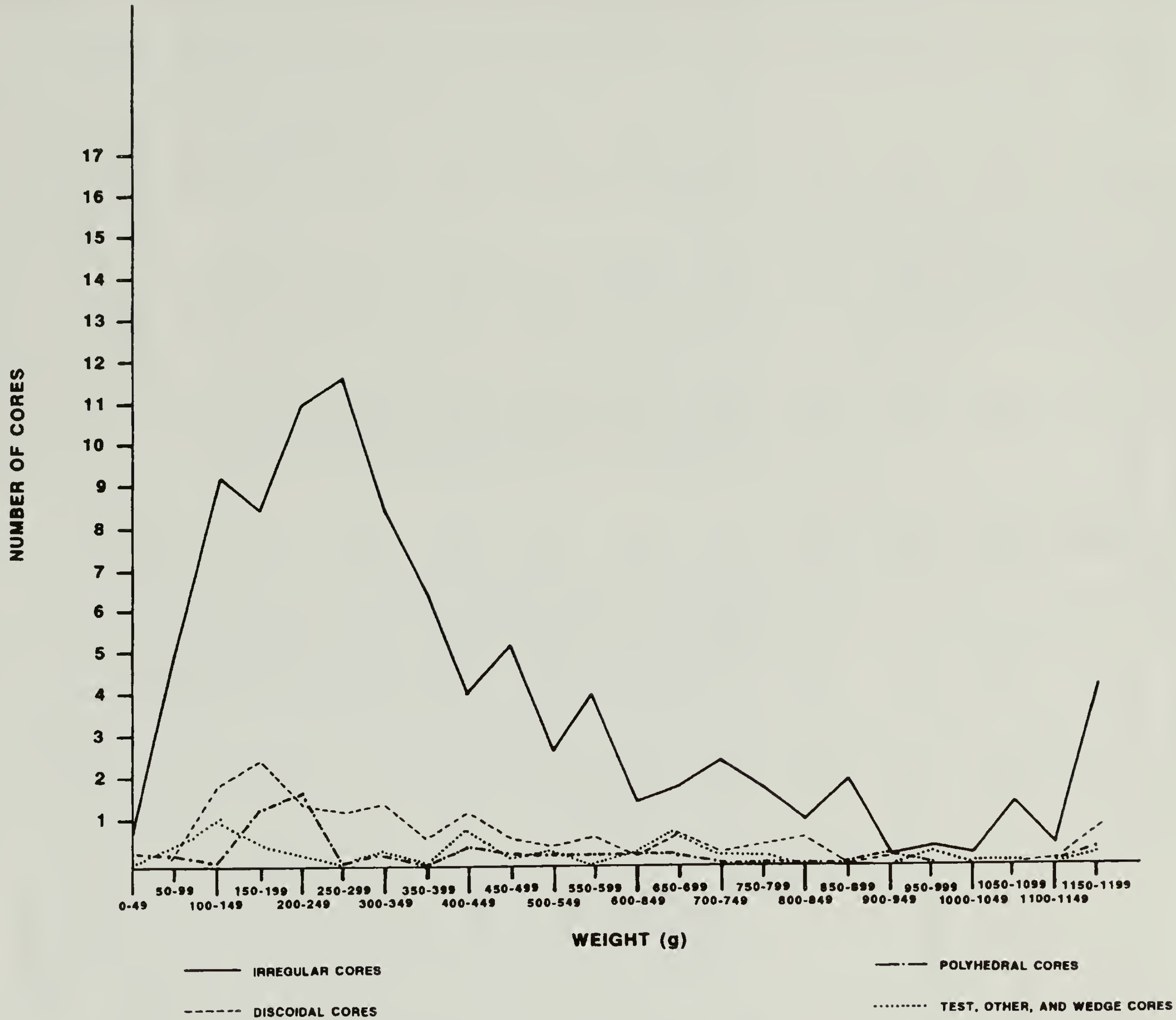

Figure 3C.3. Distribution of weight by core type.

Table 3C.2. Cores: Grouped material by grouped weight.[a]

	Weight (gm)						
Material	0-10	10.1-20	20.1-30	30.1-40	40.1-50	50.1-60	Row Total
Morrison Formation materials	0	2	1	1	0	4	8
	0.0	25.0	12.5	12.5	0.0	50.0	
	0.0	1.7	0.7	1.2	0.0	2.4	1.3
Yellow-brown spotted chert	0	1	3	0	0	2	6
	0.0	16.7	50.0	0.0	0.0	33.3	
	0.0	0.8	2.2	0.0	0.0	1.2	1.0
Washington Pass chert	4	11	10	3	1	5	34
	11.8	32.4	29.4	8.8	2.9	14.7	
	10.8	9.1	7.2	3.5	1.6	3.0	5.6
Zuni wood	1	7	1	1	0	0	10
	10.0	70.0	10.0	10.0	0.0	0.0	
	2.5	5.8	0.7	1.2	0.0	0.0	1.6
Obsidian	9	1	0	0	0	0	10
	90.0	10.0	0.0	0.0	0.0	0.0	
	22.5	0.8	0.0	0.0	0.0	0.0	1.6
High surface chert	3	20	26	19	14	31	113
	2.7	17.7	23.0	16.8	12.4	27.4	
	7.5	16.5	18.7	22.4	22.6	18.8	18.5
Cherty silicified wood	13	37	54	34	23	39	200
	6.5	18.5	27.0	17.0	11.5	19.5	
	32.5	30.6	38.8	40.0	37.1	23.6	32.7
Splintery silicified wood	1	0	0	0	0	7	8
	12.5	0.0	0.0	0.0	0.0	87.5	
	2.5	0.0	0.0	0.0	0.0	4.2	1.3
Chalcedonic silicified wood	5	24	21	12	9	20	91
	5.5	26.4	23.1	13.2	9.9	22.0	
	12.5	19.8	15.1	14.1	14.5	12.1	14.9
Quartzite	0	0	3	1	4	5	13
	0.0	0.0	23.1	7.7	30.8	38.5	
	0.0	0.0	2.2	1.2	6.5	3.0	2.1
Other	4	18	20	14	11	52	119
	3.4	15.1	16.8	11.8	9.2	43.7	
	10.0	14.9	14.4	16.5	17.7	31.5	19.4
Column Total	40	121	139	85	62	165	612
	6.5	19.8	22.7	13.9	10.1	27.0	100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3C.3. Mean weight and length of cores by material type.

Material	Weight (g)		Length (mm)	
	Mean	SD	Mean	SD
Morrison Formation materials	61.66	701.3	52.3	14.8
Yellow-brown spotted chert	38.21	227.5	44.3	14.2
Washington Pass chert	26.09	190.7	41.7	9.6
Zuni wood	17.24	79.4	38.9	5.1
Obsidian	7.84	19.9	26.6	3.4
High surface chert	48.29	524.6	45.5	11.8
Cherty silicified wood	36.30	246.7	43.6	10.1
Splintery silicified wood	77.26	386.6	54.0	17.1
Chalcedonic silicified wood	38.02	439.4	42.5	12.0
Quartzite	54.22	332.4	50.4	8.1
Others	72.23	1,009.6	50.2	17.3

technological factors affecting core processing, or lack of cortex on parent material (Table 3C.8). Exotics tended to show little cortex, while local materials, especially high surface cherts, cherty silicified wood, and quartzite showed a high frequency of cortex. Chalcedonic silicified wood, like the exotics, seemed to have a low frequency of cortex. A chi-square of material (grouped to eliminate zero-cells: all exotics combined, quartzite, and "other" combined) by cortex was significant at the 0.01 level ($\chi^2=111.12$, df=20, P=0.0000), indicating that cortical frequencies vary by material type. As a test of the effect of technological factors on the presence of cortex on cores, cortical frequency was examined by core type (Table 3C.9). Although the number of zero cells precludes the use of statistical significance, it is clear that prepared cores (discoidal and polyhedral) have less cortex than the typical irregular core and that test, wedge, and other cores have more cortex. Irregular cores, however, may simply have fewer flake scars than more fully processed core types.

Technological Attributes

Several technological attributes (other than form) are strikingly similar across all material types (Table 3C.10). The number of negative scars per core is approximately three, the number of platforms is two, and the number of negative scars per platform is one. The number of platforms with cortex seems to vary with the amount of cortex found for cores overall (Table 3C.8); e.g., exotics and 1140 series (chalcedonic silicified wood) have few cortical platforms, while local materials have more. Technological attributes, when summarized by core type (Table 3C.11), show somewhat greater variability. Discoidal and polyhedral cores have the highest number of negative scars, as would be expected from these two prepared core types, and polyhedral cores have the lowest number of platforms. "Other" cores also have a low number of platforms. These cores include test cores, which should have only one platform, and wedge cores, which typically have two platforms. The number of negative scars per platform is highest for polyhedral cores, as would be expected from the regular manner in which this type of core is produced. Irregular cores have the lowest number of negative scars per platform, again the expected result of the haphazard formation of this core type. The average number of platforms with cortex is highest for "other" cores, undoubtedly a result of the inclusion of test cores within this type. It is lowest for discoidal cores, which might be assumed to have been more fully used (in order to have resulted in a discoidal shape) and thus less likely to show cortical platforms.

Temporal Distribution

Temporal Variations in Material Type

The temporal distribution of cores is shown in Table 3C.12, with the percent of each material type within each time period compared with the same percent for all chipped stone. There seem to be more

Table 3C.4. Cores: Material type by core type.[a]

	Type of Core						
Material	Irregular	Discoidal	Polyhedral	Test	Other	Wedge	Total
Morrison Formation	7	1	0	0	0	0	8
materials	87.5	12.5	0.0	0.0	0.0	0.0	
	1.5	1.3	0.0	0.0	0.0	0.0	1.4
Yellow-brown spotted	5	1	0	0	0	0	6
chert	83.3	16.7	0.0	0.0	0.0	0.0	
	1.1	1.3	0.0	0.0	0.0	0.0	1.0
Washington Pass chert	26	7	1	0	0	0	34
	76.5	20.6	2.9	0.0	0.0	0.0	
	5.5	9.3	3.6	0.0	0.0	0.0	5.7
Zuni wood	6	2	1	0	0	1	10
	60.0	20.0	10.0	0.0	0.0	10.0	
	1.3	2.7	3.6	0.0	0.0	5.6	1.7
Obsidian	6	0	1	2	0	0.0	9
	66.7	0.0	11.1	22.2	0.0	0.0	
	1.3	0.0	3.6	33.3	0.0	0.0	1.5
High surface chert	97	11	4	1	0	0	113
	85.8	9.7	3.5	0.9	0.0	0.0	
	20.6	14.7	14.3	16.7	0.0	0.0	18.9
Cherty silicified wood	154	19	7	0	1	14	195
	79.0	9.7	3.6	0.0	0.5	7.2	
	32.8	25.3	25.0	0.0	100.0	77.8	32.6
Splintery silicified wood	4	0	0	0	0	1	5
	80.0	0.0	0.0	0.0	0.0	20.0	
	0.9	0.0	0.0	0.0	0.0	5.6	0.8
Chalcedonic silicified	74	12	1	0	0	2	89
wood	83.1	13.5	1.1	0.0	0.0	2.2	
	15.7	16.0	3.6	0.0	0.0	11.1	14.9
Quartzite	5	4	3	1	0	0	13
	38.5	30.8	23.1	7.7	0.0	0.0	
	1.1	5.3	10.7	16.7	0.0	0.0	2.2
Others	86	18	10	2	0	0	116
	74.1	13.0	8.6	1.7	0.0	0.0	
	18.3	20.0	35.7	33.3	0.0	0.0	19.4
Total	470	75	28	6	1	18	598
	78.6	12.5	4.7	1.0	0.2	3.0	100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3C.5. Core type (2-4) by grouped material.[a]

Material	Discoidal	Polyhedral	Test Wedge/Other	Row Total
Exotics	11 64.7 14.7	3 17.6 10.7	3 17.6 12.0	17 13.3
High surface chert	11 68.8 14.7	4 25.0 14.3	1 6.3 4.0	16 12.5
Cherty silicified wood	19 46.3 25.3	7 17.1 25.0	15 36.6 60.0	41 32.0
Chalcedonic silicified wood	12 80.0 16.0	1 6.7 3.6	2 13.3 8.0	15 11.7
Other	22 56.4 29.3	13 33.3 46.4	4 10.3 16.0	39 30.5
Column Total	75 58.6	28 21.9	25 19.5	128 100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3C.6. Mean length and weight of cores by core type.

	Length (mm)		Weight (g)	
	Mean	SD	Mean	SD
Irregular	45.1	12.9	48.59	677.3
Discoidal	46.2	12.5	44.987	530.0
Polyhedral	46.8	16.9	43.76	500.7
Test	39.3	13.3	29.70	224.5
Other	53.0	0.0	79.30	0.0
Wedge	50.0	17.4	45.72	332.9

Table 3C.7. Core type by grouped weight.[a]

Type	0-100	101-200	201-300	301-400	401-500	501-600 and above	Row Total
Irregular	30 6.4 78.9	87 18.6 72.5	117 24.9 84.8	70 14.9 83.3	47 10.0 75.8	118 25.2 76.1	469 78.6
Discoidal	1 1.3 2.6	22 29.3 18.3	12 16.0 8.7	11 14.7 13.1	8 10.7 12.9	21 28.0 13.5	75 12.6
Polyhedral	3 10.7 7.9	6 21.4 5.0	8 28.6 5.8	2 7.1 2.4	2 7.1 3.2	7 25.0 4.5	28 4.7
Test Wedge/Other	4 16.0 10.5	5 20.0 4.2	1 4.0 0.7	1 4.0 1.2	5 20.0 8.1	9 36.0 5.8	25 4.2
Column Total	38 6.4	120 20.1	138 23.1	84 14.1	62 10.4	155 26.0	597 100.0

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

cores in the A.D. 500s than would be expected from overall chipped stone frequencies. In other time periods, cores seem to form a regular percentage of the assemblage.

Cores of exotic material are almost nonexistent in the periods from A.D. 500 to 920. They begin to occur in the period from A.D. 920 to 1020 and peak in frequency from A.D. 1020 to 1120. This pattern is very similar to that found for all exotic chipped stone, although the frequencies for exotic cores is never quite as high.

Again (see Material Comparisons above), there seem to be more cores of cherty silicified wood and fewer cores of chalcedonic silicified wood than would be expected from a comparison of the frequencies of these materials for all chipped stone, perhaps because of the natural occurrence of these materials. Cores of splintery silicified wood occur only from A.D. 920 to 1120 (with one exception) and this is the period when this material is most frequent in all chipped stone. In general, the variation in material type by time period for cores is very similar to this variation for all chipped stone, the notable difference being the absence of cores of exotic material in early time periods. Exotic materials during these early periods were brought in mostly as finished tools.

Greathouse versus Small-house Sites

A comparison of material type for cores between greathouse and small-house sites (Table 3C.13 for periods from A.D. 920 to 1120) produces very similar results to those found for all chipped stone. The greathouses (primarily Pueblo Alto) in the period from A.D. 920 to 1020 produced no exotic cores and most exotic cores were found in the period from A.D. 1020 to 1120. Cores of yellow-brown chert were found only in small-house sites, while cores of Zuni wood were found only in the greathouse. Local materials, too, follow the general pattern set by the chipped stone collection as a whole.

Form by Time

Variation in core type by time period (Table 3C.14) appears to be slight, although the overwhelming frequency of irregular cores may overshadow variation in the other types. Polyhedral cores seem to concentrate in the A.D. 500s and from A.D. 920 to 1020, while wedge cores are found almost exclusively in the period from A.D. 920 to 1020; however, a chi-square test excluding irregular cores (Types 3 through 6, with Types 4, 5, and 6 combined), and combining Time Periods 2 through 5, 6 and 7, while ignoring Periods 8 and 12 is not

Table 3C.8. Material type by amount of cortex.[a]

Material	Cortex	1-25%	26-50%	51-75%	76-100%	Total
Morrison Formation materials	4 50.0 2.5	3 37.5 1.3	1 12.5 0.8	0 0.0 0.0	0 0.0 0.0	8 1.3
Yellow-brown spotted chert	3 50.0 1.9	2 33.3 0.9	1 16.7 0.8	0 0.0 0.0	0 0.0 0.0	6 1.0
Washington Pass chert	24 70.6 14.8	8 23.5 3.5	2 5.9 1.5	0 0.0 0.0	0 0.0 0.0	34 5.5
Zuni wood	8 80.0 4.9	2 20.0 0.9	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	10 1.6
Obsidian	2 20.0 1.2	1 10.0 0.4	2 20.0 1.5	3 30.0 4.3	2 20.0 8.7	10 1.6
High surface chert	11 9.7 6.8	49 43.4 21.7	30 26.5 22.7	16 14.2 22.9	7 6.2 30.4	113 18.4
Cherty silicified wood	45 22.4 27.8	83 41.3 36.7	44 21.9 33.3	26 12.9 37.1	3 1.5 13.0	201 32.8
Splintery silicified wood	0 0.0 0.0	4 50.0 1.8	3 37.5 2.3	1 12.5 1.4	0 0.0 0.0	8 1.3
Chalcedonic silicified wood	37 40.7 22.8	40 44.0 17.7	9 9.9 6.8	4 4.4 5.7	1 1.1 4.3	91 14.8
Quartzite	1 7.7 0.6	4 30.8 1.8	3 23.1 2.3	2 15.4 2.9	3 23.1 13.0	13 2.1
Others	27 22.7 16.7	30 25.2 13.3	37 31.1 28.0	18 15.1 25.7	7 5.9 30.4	119 19.4
Total	162 26.4	226 36.9	132 21.5	70 11.4	23 3.8	613 100.6

[a] Cells are presented as follows:
Count,
Row percent,
Column percent.

Table 3C.9. Amount of cortex by core type.[a]

Material	No Cortex	1-25%	26-50%	51-75%	76-100%	Row Total
Irregular	118 25.1 74.7	172 36.6 77.5	107 22.8 82.3	56 11.9 86.2	17 3.6 73.9	470 78.6
Discoidal	26 34.7 16.5	32 42.7 14.4	13 17.3 10.0	3 4.0 4.6	1 1.3 4.3	75 12.5
Polyhedral	11 39.3 7.0	11 39.3 5.0	6 21.4 4.6	0 0.0 0.0	0 0.0 0.0	28 4.7
Test Wedge/Other	3 12.0 1.9	7 28.0 3.2	4 16.0 3.1	6 24.0 9.2	5 20.0 21.7	25 4.2
Column Total	158 26.4	222 37.1	130 21.7	65 10.9	23 3.8	598 100.0

[a] Cells presented as follows:
Count,
Row percent,
Column percent.

Table 3C.10. Attributes of cores by material.

Material	% Cores with <50% Cortex	Mean No. Negative scars	Mean No. Platforms	Mean No. Platforms w/Cortex	Number Flake Scars Per Platform	Total
Morrison Formation materials	12.5	3.4	2.9	0.25	1.2	8
Yellow-brown spotted chert	16.7	3.7	3.5	-	1.1	6
Washington Pass chert	5.9	2.8	2.5	0.29	1.1	34
Zuni wood	-	2.9	2.2	0.50	1.3	10
Obsidian	70.0	2.4	2.3	0.70	1.0	10
High surface chert	40.7	3.4	2.7	0.92	1.3	113
Cherty silicified wood	34.8	3.2	2.5	0.81	1.3	201
Splintery silicified wood	50.0	2.9	2.2	1.13	1.3	8
Chalcedonic silicified wood	14.3	2.9	2.5	0.41	1.2	91
Quartzite	38.5	3.2	2.8	1.08	1.1	13
Other	46.2	3.5	2.6	0.97	1.3	119

Table 3C.11. Core attributes by core type.

Type	% Cores with >50% Cortex	Mean No. Neg. Scars	Mean No. Platforms	No. Neg. Scars/ Platforms	Avg. No. Platforms w/ Cortex	Total
Irregular	15.5	3.1	2.67	1.16	0.79	470
Discoidal	5.3	3.8	2.59	1.48	0.44	75
Polyhedral	0.0	3.9	1.71	2.27	0.54	28
Other	44.0	2.8	1.72	1.65	1.24	25

Table 3C.12. Material type by period for cores compared to all chipped stone.

Material	Period: 2 A.D. 500s	3 A.D. 600s	4 A.D. 700-820	5 A.D. 820-920	6 A.D. 920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320	Total
Morrison Formation materials	-	-	-	-	1 0.7 (0.4)	5 4.4 (4.3)	1 8.3 (2.6)	-	7 1.6
Yellow-brown spotted chert	-	-	-	-	2 1.4 (0.3)	3 2.7 (0.9)	-	-	5 1.2
Washington Pass chert	-	-	-	-	2 1.4 (2.1)	18 15.9 (21.1)	1 8.3 (18.9)	-	21 4.8
Zuni wood	-	-	-	-	-	5 4.4 (2.8)	1 8.3 (1.1)	-	6 1.4
Obsidian	2 2.0 (3.1)	-	-	-	-	-	1 8.3 (7.3)	-	3 0.7
High surface chert	36 36.4 (34.1)	3 30.0 (20.1)	7 21.9 (17.2)	2 11.1 (9.6)	16 10.8 (8.6)	15 13.3 (5.8)	2 16.7 (9.8)	-	81 18.7
Cherty silicified wood	22 22.2 (11.1)	-	12 37.5 (23.4)	10 55.6 (43.4)	61 41.2 (32.8)	32 28.3 (16.6)	2 16.7 (14.1)	1 50.0 (8.4)	140 32.3
Splintery silicified wood	1 1.0 (2.8)	-	-	-	3 2.0 (7.2)	2 1.8 (17.6)	-	-	6 1.4
Chalcedonic silicified wood	12 12.1 (29.1)	4 40.0 (31.3)	4 12.5 (38.3)	2 11.1 (26.9)	32 21.6 (33.6)	9 8.0 (11.5)	1 8.3 (16.6)	1 50.0 (34.0)	65 15.0
Quartzite	1 1.0 (5.0)	-	-	1 5.6 (2.2)	1 0.7 (2.9)	9 8.0 (7.0)	-	-	12 2.8
Other	25 25.3 (12.6)	3 30.0 (13.5)	9 28.1 (11.9)	3 16.7 (8.9)	30 20.3 (11.1)	15 13.3 (12.1)	3 25.0 (14.7)	-	88 20.3
Total	99 22.8 (11.0)	10 2.3 (1.1)	32 7.4 (5.2)	18 4.1 (2.7)	148 34.1 (39.8)	113 26.0 (29.5)	12 2.8 (8.9)	2 0.5 (1.8)	434

(X.X) = % for all chipped stone.

Table 3C.13. Frequency of material for cores: Greathouse and small-house sites compared to all chipped stone.

	A.D. 920-1020		A.D. 1020-1120		A.D. 1120-1220		
Material	Greathouses	Small-houses	Greathouses	Small-houses	Greathouses	Small-houses	Total
Morrison Formation materials	-	1 0.7 (0.3)	5 7.7 (5.4)	-	1 8.3 (2.4)	-	7
Yellow-brown spotted chert	-	2 1.4 (0.3)	-	3 6.3 (2.0)	-	-	5
Washington Pass chert	-	2 1.4 (1.3)	18 27.7 (26.0)	-	1 8.3 (19.2)	-	21
Zuni wood	-	-	5 7.7 (3.6)	-	1 8.3 (1.2)	-	6
Obsidian	-	-	-	-	1 8.3 (7.4)	-	1
High surface chert	-	16 11.3 (8.5)	4 6.2 (4.5)	11 22.9 (10.3)	2 16.7 (9.7)	-	33
Cherty silicified wood	3 50.0 (20.9)	58 40.8 (34.6)	11 16.9 (9.9)	21 43.8 (38.7)	2 16.7 (14.3)	-	95
Splintery silicified wood	-	3 2.1 (7.9)	1 1.5 (20.4)	1 2.1 (7.3)	-	-	5
Chalcedonic silicified wood	1 16.7 (33.2)	31 21.8 (33.6)	5 7.7 (8.4)	4 8.3 (23.0)	1 8.3 (16.3)	-	42
Quartzite	-	1 0.7 (2.6)	8 12.3 (8.4)	1 2.1 (1.9)	-	-	10
Other	2 33.3 (19.6)	28 19.7 (9.9)	8 12.3 (12.4)	7 14.6 (11.4)	3 25.0 (14.3)	-	48
Total	6 2.1	142 52.0	65 23.8	48 17.6	12 4.4	-	273

Table 3C.14. Core type by period.[a]

Type	Period: 2 A.D. 500s	3 A.D. 600s	4 A.D.700-820	5 A.D. 820-920	6 A.D.920-1020	7 A.D. 1020-1120	8 A.D. 1120-1220	12 A.D. 1220-1320	Row Total
Irregular	77 22.6 77.8	6 1.8 66.7	30 8.8 93.8	13 3.8 72.2	113 33.2 80.7	89 26.2 78.8	10 2.9 83.3	2 0.6 100.0	340 80.0
Discoidal	12 21.8 12.1	3 5.5 33.3	2 3.6 6.3	5 9.1 27.8	16 29.1 11.4	16 29.1 14.2	1 1.8 8.3	0 0.0 0.0	55 12.9
Polyhedral	8 44.4 8.1	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	3 16.7 2.1	7 38.9 6.2	0 0.0 0.0	0 0.0 0.0	18 4.2
Test	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	1 50.0 0.7	1 50.0 0.9	0 0.0 0.0	0 0.0 0.0	2 0.5
Wedge	2 20.0 2.0	0 0.0 0.0	0 0.0 0.0	0 0.0 0.0	7 70.0 5.0	0 0.0 0.0	1 10.0 8.3	0 0.0 0.0	10 2.4
Column Total	99 23.3	9 2.1	32 7.5	18 4.2	140 32.9	113 26.6	12 2.8	2 0.5	425 100.0

[a] Cells presented as follows:
Count,
Row percent,
Column percent.

Table 3C.15. Spatial distribution of cores compared to all chipped stone.

	Cores No.	Cores %	All Chipped Stone (with Cores)
Ramada/living room fill	9	2.1	2.9%
Ramada/living room floor	12	2.8	2.9%
Storage room fill	6	1.4	3.4%
Storage room floor	2	0.5	0.8%
Room trash fill	13	3.0	3.9%
Pitstructure trash fill	95	21.9	20.9%
Pitstructure other fill	51	11.8	5.3%
Pitstructure floors	29	6.7	2.3%
Plaza/ramada fill	11	2.5	4.9%
Trash mound	112	25.8	36.5%
Site feature fill/floor	1	0.2	0.2%
Site surface	15	3.5	3.0%
Miscellaneous	78	18.0	12.8%
Total	434	100.2	

significant at the 0.01 level (χ^2=2.29, df=2, P=0.3167). This indicates little variability among specific core types over time.

Spatial Variability

The spatial distribution of cores seems to be representative of the distribution of other types of chipped stone. The occurrence of cores within spatial components of the time-space matrix is shown in Table 3C.15 in comparison with relative frequencies of all chipped stone for the same time-space group. Cores are concentrated in pitstructure fill, trash mound fill, and miscellaneous features. The same, however, is true for other types of chipped stone.

Summary

Material type follows fairly closely the material proportions in the general chipped stone population. Cores tend to be irregular and the presence of cortex on cores varies by material type, with exotics and chalcedonic silicified wood showing little cortex. In this and in core size, 1140 series material resembles exotics. There is no evidence that cores of exotic material were given technologically different treatment than those of local material; they are simply smaller. In general, temporal and spatial variation among cores seems to be very similar to the temporal and spatial variability found among the chipped stone collection as a whole.

Reference

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Chapter Four

Points, Knives, and Drills of Chaco Canyon

Stephen H. Lekson

Introduction

This chapter (written in 1985) summarizes a 200-page manuscript report, replete with abbreviations, graphs, and SPSS tables, prepared as a summary of Chaco chipped stone tools (Lekson 1980a, incorporting Bradley 1980—see Appendix 4.A). The goals of that unwieldly, unpublishable report were modest: to provide context for detailed site-by-site and synthetic project-level analyses. But those analyses were never undertaken. Thus, this chapter provides a reader's digest of the longer manuscript with some odd observations which arose during its writing. The lithically-inclined reader should be aware of the detailed information tabularized and discussed in the 1980 report (useful, perhaps, to arrowhead fanatics, if not to the casual reader), and the large computerized data base of (I hope) high-quality metric and non-metric data (see Table 4.1) on over 1,700 chipped stone tools from Chaco Canyon. Both are accessible through the Intermountain Cultural Resource Center of the National Park Service in Santa Fe, New Mexico. This chapter is not intended to provide a comprehensive presentation or synthesis of the chipped stone tools of Chaco Canyon. Caveat emptor.

The collection includes about 500 points, knives, and drills from Chaco Project excavations and about 1200 tools from other Chaco investigations. The initial approach was typological, but the success of the typology was limited. Within the class of points, the goal was to refine the conventional types. "Knives" includes several very different kinds of tools. Drills were so few as to make typological concerns moot. In the end, the most interesting results of the analysis concerned not typology, but instead, the condition and the context of the tools, and the use of the collection as a frame of reference for interpreting particular sites. In fairness to the research potential of the collection, my interpretive emphases have more to do with the psychology of the analyst than any shortcomings of the tools themselves. There is much yet to be learned from the Chaco collection.

The Collection

The analysis began with 552 tools: projectile points (tool types 202-207, 215, 218 and 219; Cameron, this volume), facially flaked "knives" (blades without visible hafting elements—tool types 210 and 213), drills (tool types 231-237), and miscellaneous fragments (tool types 209 and 217) from 17 sites excavated by the Chaco Project. How representative were these tools? Did they reflect the kinds of tools found in all time periods, at all kinds of sites at Chaco? The first concern was to evaluate (typologically) the excavated tools as a sample, both of Chacoan lithics and of the broader Anasazi lithic tradition. To this end, the collection was increased by adding tools from other sites in Chaco. These included:

1) Surveys of Chaco Canyon: Judges' and Hayes' surveys (Hayes et al. 1981) produced a total of 445 tools, which were stored at the Chaco Center.

2) Chaco Center Collections: Collections from previous National Park Service work in Chaco Canyon (mostly salvage excavations and excavations incidental to stabilization) were also stored at the

Table 4.1. Variables coded in chipped stone tool database.

Variable No.	Columns	Name
1	1	County
2	2-5	Site number
3	6-11	FS number with suffix
4	12-15	Time period
5	16-19	Material
6	20	Class
7	21-22	Condition
8	23-26	Weight
9	27-29	Total length
10	30-31	Blade length
11	32-33	Base length
12	34-35	Maximum width
13	36-37	Shoulder width
14	38-39	Base width
15	40-41	Minimum stem-width
16	42-43	Maximum thickness
17	44-45	Minimum stem-width-thickness
18	46	Base edge shape
19	47	Tip
20	48-49	Blade shape
21	50	Base shape
22	51-52	Haft shape
23	53	Edge modification
24	54	Lateral cross-section
25	55	Longitudinal cross-section
26	56	Blank form
27	57	Orientation to flake blank
28	58	Primary flaking
29	59	Retouch/finishing
30	60	Form result
31	61	Projectile point use
32	62	Edge damage form
33	63	Edge damage type
34	64	Craftsmanship
35	66	Quality of association
36	67-69	Barb (notch) length
37	70-72	Base edge (notch) length
38	73-75	Barb-to-base (notch) length
39	76-78	Notch angle

Chaco Center. These totalled 260 tools with proveniences varying from "Chaco Canyon" to specific layers, levels, and rooms at excavated sites (Kin Kletso, Three-C, Una Vida, Talus Unit, and several "Bc" sites).

3) Collections at the Park: Chaco Culture National Historical Park maintains collections from recent stabilization, finds by visitors, and other sources. These included 228 tools, most of which were poorly provenienced.

4) Maxwell Museum Collections: The Chaco Center enjoyed a convenient location: on the second story of the Department of Anthropology at the University of New Mexico and in the north end of the same building that houses the Maxwell Museum of Anthropology. The department undertook extensive excavations in Chaco Canyon in the 1930s and 1940s, and the surviving collections are stored in the Maxwell Musuem. Forty-eight tools from Bc 50, Bc 51, and Bc 58 were included from the Maxwell collections.

5) Materials from the Smithsonian Institution: Long after the 1980 report was completed, the Smithsonian Institution loaned several of Judd's more spectacular chipped stone tools from Pueblo Bonito. In addition to these unusually fine examples, there were 152 other tools from this source (about half of Judd's collection). These are discussed here, but were not included in the 1980 analysis.

With the addition of tools from these sources, the study collection totals 1,774 points, knives, and drills, with 90 percent of these items coming from 295 dated contexts. One-third of these "dated" materials are from surface collections. About 10 percent of the collection had no useful provenience beyond the strong likelihood that the items came from Chaco Canyon.

The materials from sites in Chaco Canyon should be considered for future analyses requiring a large sample of Anasazi Basketmaker II to Pueblo III tools. This collection does not exhaust the museum resources from Chaco Canyon. Because of time constraints, these additions were limited to readily available collections. Judd recovered at least 236 more tools from Pueblo Bonito and Pueblo del Arroyo; Pepper mentions over 660 points from just three rooms at Pueblo Bonito (Pepper 1920). The total number of tools from Chaco Canyon in various museum collections will possibly exceed 3,000; probably 80 percent of these would have useful proveniences. The research potential is enormous and this analysis only hints at the kinds of information that might result.

Although the Chaco Project excavated a temporal series of sites ranging from Archaic through Navajo, material from other sources was almost entirely Anasazi and the formal composition of the collection reflects this. The major tool class, as in almost all Anasazi tool assemblages, is arrow points. Almost 45 percent of the collection was Basketmaker III to early Pueblo III arrow points. Knives made up 17 percent of the collection and it is argued below that some of these were, in fact, arrow point blanks. Drills constituted only 6 percent of the collections.

Thus, about 70 percent of the collection were points, knives, and drills. Of the other 30 percent, half were unclassifiable tool fragments (point tips, small blade fragments, etc.) and half were true "miscellaneous." This last category includes a series of about 95 Archaic points (tool types 208, 214, 220, 239) and some tools in types 215 and 219 (Cameron, this volume). These numbered tool types represented provisional subdivisions of the Archaic points that were later abandoned. Most of the typologically identified Archaic points came from Anasazi contexts; a Bajada point from the surface of the plaza of Kin Bineola and a Jay point from a sealed kiva niche at Pueblo Bonito, etc. Anasazi reuse of these points is of interest, but not a topic that will be pursued at length here. Because these Archaic points are almost certainly out of context and the Archaic of Chaco Canyon will be considered elsewhere, the present discussion excludes pre-Basketmaker materials and instead emphasizes the strength of the collection—Pueblo period points (mainly arrow points), knives, and drills.

The Analysis

Detailed definitions of the variables recorded in this analysis are on file in the Chaco Project Archives (Lekson 1980a). Summarized here are the kinds of observations made and what it was hoped they would show.

1) Temporal assignment: Along with provenience data, each tool was assigned to a Pecos System-based temporal scheme, if possible. The variant of the Pecos System used was that developed for Chaco Canyon by Hayes (Hayes et al. 1981). This allowed use of the temporal data from Hayes' survey. Tom Windes translated Hayes' Pecos units into time-spans determined by our excavations (Table 4.2). The vast majority of the collection, as noted above, was Pueblo II-Pueblo III. In addition, an evaluation of the quality of the date was made, noting whether the date was from an excavated context, a good surface context (Hayes's and Judge's surveys), a poor surface context, or a dubious context.

Table 4.2. Temporal framework.[a]

Hayes' System	Excavation Periods (A.D.)
Paleo/Archaic	
Basketmaker III (early)	500-600
Basketmaker III (middle)	600-700
Basketmaker III (late)	700-820
Pueblo I	820-920
Early Pueblo II	920-1020
Late Pueblo II	1020-1120
Early Pueblo III	1120-1220
Late Pueblo III	1220-1300+
Navajo	1700+

[a](Hayes 1981; T. C. Windes, personal communication, 1980).

2) Material: The materials of the excavated tools had already been identified by Cameron. She also identified the materials of all other tools in the collection, using the same four-digit code system (Cameron, this volume).

3) Condition: Breakage was recorded and the missing sections specified (if possible) both to allow study of use and discard and to flag projected measurements (described below).

4) Weight: Weight has obvious significance for projectiles and has been used in the past to separate arrow points from dart points. This use, however, is questionable because the range of weights of known arrow points is considerable and includes items heavier than almost anything in the Chaco collection.

5) Measurements: Maximum length, width, and thickness were recorded for the item "as is." Blade length, base length, shoulder width, base width, and minimum stem width and thickness were measured directly, or were projected (by assuming bifold symmetry on the long axis of the tool) on broken or incomplete specimens. Because these measurements are straightforward and few will be relied on here for interpretation, I will spare the

reader a detailed description of the landmarks used in making them (see Lekson 1980a).

6) Form: Form was the least tractable aspect of tools. Today, I would not hesitate to use a coordinate recording system such as that developed by the Dolores Archeological Project (Vierra and Phagan 1984). This seems the best available way to deal with the subtle variability in Anasazi tools. But in 1980, with over 1,000 arrow points to be processed in less than a month, a typological approach was chosen. This was a modification of the system used by Arthur Jelinek for Pecos Valley materials (Jelinek 1967).

It is no reflection on Jelinek's analysis that my modification of this system was not entirely satisfactory for the Chaco collections. The Pecos Valley materials were more equitably distributed over a longer time period and, thus, exhibited much more formal variability than did the Chaco materials. I modified Jelinek's system after locking myself in a room with a small, temporally stratified sample of Chaco tools—a sample selected for maximum formal variability. The format developed included six base edge shapes, eight blade shapes (expandable to 36 combinations), and 81 haft shapes—nearly 17,500 morphological possibilities. (This does <u>not</u> include variation in lateral and longitudinal cross-sections or blade edge modification, all of which were also recorded in the analysis.)

Hopefully, sufficient flexibility was built into the system of formal recording to comfortably encompass the range of forms in the sample; but the sample, as it turns out, did not represent the range of forms in the collection. The great majority of the tools in the collection—Basketmaker III to early Pueblo III arrow points—were described by very few combinations of blade, base, and haft form, and significant variability <u>within</u> some of those combinations was seen. The system failed to capture the detailed morphological variation within the most common tool type, the arrow point.

As a result, this analytical approach to form was not considered reliable, and it will not be described in any more detail here. Instead, tools, particularly arrow points, will be discussed within the framework of established formal types (e.g., stemmed, corner-notched, and side-notched points). Discussion of variation <u>within</u> these formal types will, of course, be informed by the ill-fated formal analysis as well as post-1980 observations.

7) Technology of Manufacture: A quick, intelligent analysis of technology required the insights of an expert knapper. (I am not a knapper.) This part of the analysis was undertaken by Bruce Bradley, who recorded six attributes he thought were meaningful for technological interpretations. These included: blank form, orientation to flake blank, primary flaking, retouch/finishing, form result, and craftsmanship (Bradley 1980).

8) Edge Damage: The final area of interest was use, as indicated by edge damage. This part of the analysis was also contracted out to Bradley. He recorded two variables of edge damage, location and type (Bradley 1980).

Arrow Points

Arrow points were defined as hafted points with a minimum stem width of less than 10 mm—an exclusive rather than inclusive definition. The original use of these points on arrows is not thought to be at issue; there are numerous preserved prehistoric arrows from sites in Chaco Canyon and other Anasazi areas which have examples of all the formal classes here called arrow points mounted as tips. Points within this group are almost certainly arrow points, but some points with larger stem diameters are probably arrow points too.

<u>Form</u>

The typological trinity of stemmed, corner-notched, and side-notched arrow points (Figure 4.1) reaches back at least to Earl Morris (1919:34) and no doubt even earlier. It is a typology that has weathered well and easily encompasses almost all of the arrow points from Chaco Canyon. A seriation of approximately datable arrow points in the collection (including surface collections) suggests the temporal validity of the types (Table 4.3 and Figure 4.2—cf. excavated points only, Cameron, this volume). On this level, all but a handful of Chaco arrow points are very similar to those of the rest of the San Juan area.

While the time-honored typology works quite well, there is significant variation within these forms, evident in a better-dated series of about 100 points from Chaco Center excavations. Formal change in

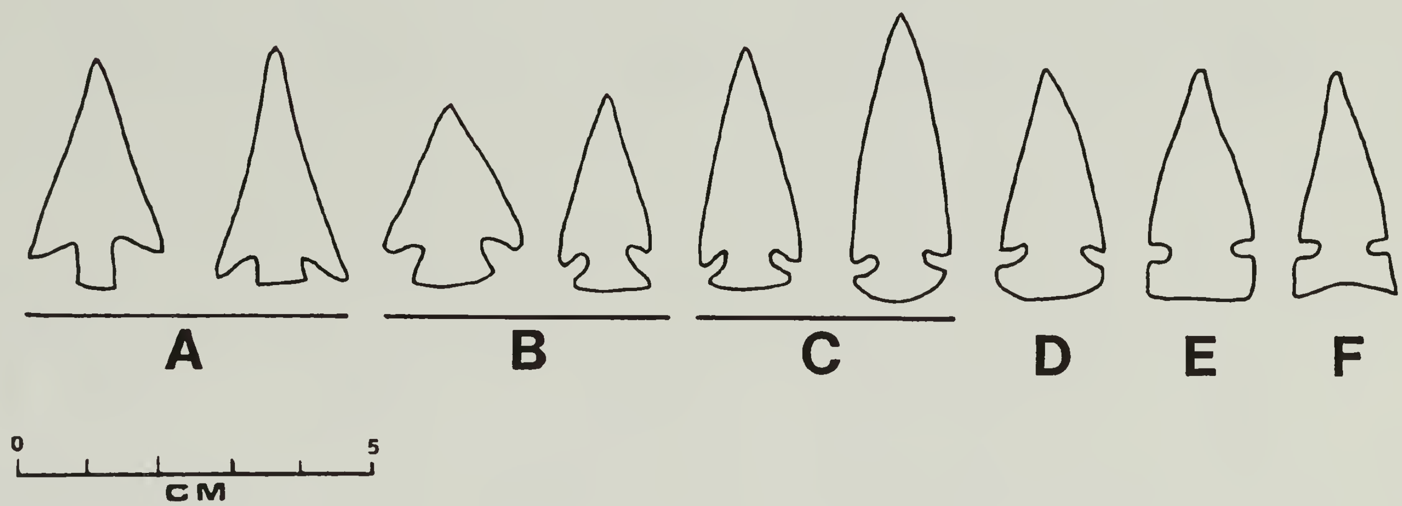


Figure 4.1. *Synoptic point series. A) Stemmed. B, C) Corner-notched. D, E, F) Side-notched. For explanation, see text. Left to right: 29SJ 629 [FS 578]; 29SJ 2252; 29SJ 1641; Talus Unit, Kiva J fill; Bc 51, Room 49 fill; Pueblo Bonito, Kiva B; Bc 59, east trash; Una Vida, Room 23 fill; Kin Kletso.*

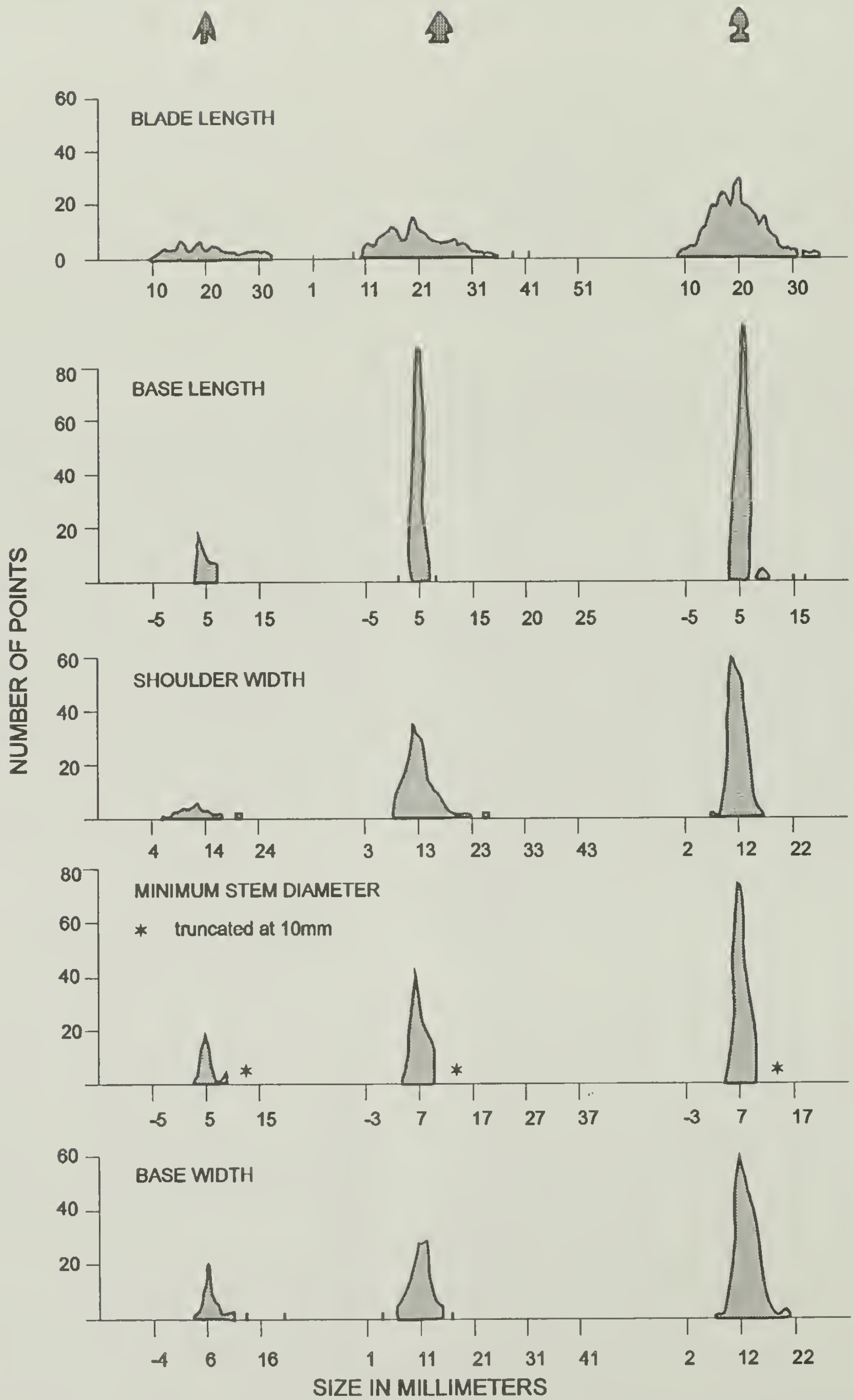


Figure 4.2. Percentage seriation of 400 well-dated arrow points assigned to Basketmaker III, Pueblo I, Pueblo II, and Pueblo III periods.

Table 4.3. Percentage seriation of 400 well-dated arrow points assigned to Basketmaker III, Pueblo I, Pueblo II, and Pueblo III periods.

Period	Stemmed	Corner-notched	Side-notched
Basketmaker III-Pueblo I	60.4	27.1	12.5
Pueblo II	13.0	49.3	37.7
Pueblo III	3.2	17.4	79.4

this small but useful series of points can most conveniently be described as a synoptic developmental series (Figure 4.1). Form A (stemmed points) were found in early, middle, and late Basketmaker III contexts and continued in Pueblo I and perhaps into early Pueblo II (Figure 4.3, E5), although this last is doubtful. Widening the base of the Form A stem could produce the earliest corner-notched Form B, which was found in middle and late Basketmaker III contexts. Since the necessary intermediate forms were <u>not found</u>, this derivation of corner-notching is not particularly convincing. In fact, the change from stemmed to corner-notched points seems, to me, to be the greatest discontinuity in the developmental sequence. With the inception of corner-notching, there is a much clearer developmental sequence through the later side-notched forms.

Referring again to Figure 4.1, assume a pointed-ovate blank with a pointed tip and rounded base. To create Form B (corner-notched), wide and relatively shallow notches are removed from the juncture of blade and base. In corner-notched Form C, seen mainly in early Pueblo II contexts, the same blank is modified by the removal of narrow, deep notches (much like the notch in later side-notched points); again, beginning at the juncture of the blade and the base and slanting towards the point. If the notches are moved slightly above (distally) the juncture of blade and base and are slightly more perpendicular to the long axis of the blank, Form D results. Form D was the earliest side-notched form and was generally found in late Pueblo II contexts. In early Pueblo III, the shape of the blank is modified by the straightening or flattening of the base, producing a much more marked point of blade-base juncture, and the notches are made even more perpendicularly to the axis of the blank, resulting in Form E. In Form F, seen in the latest Anasazi contexts, this modification of the base of the point is occasionally extended to a very slightly concave base.

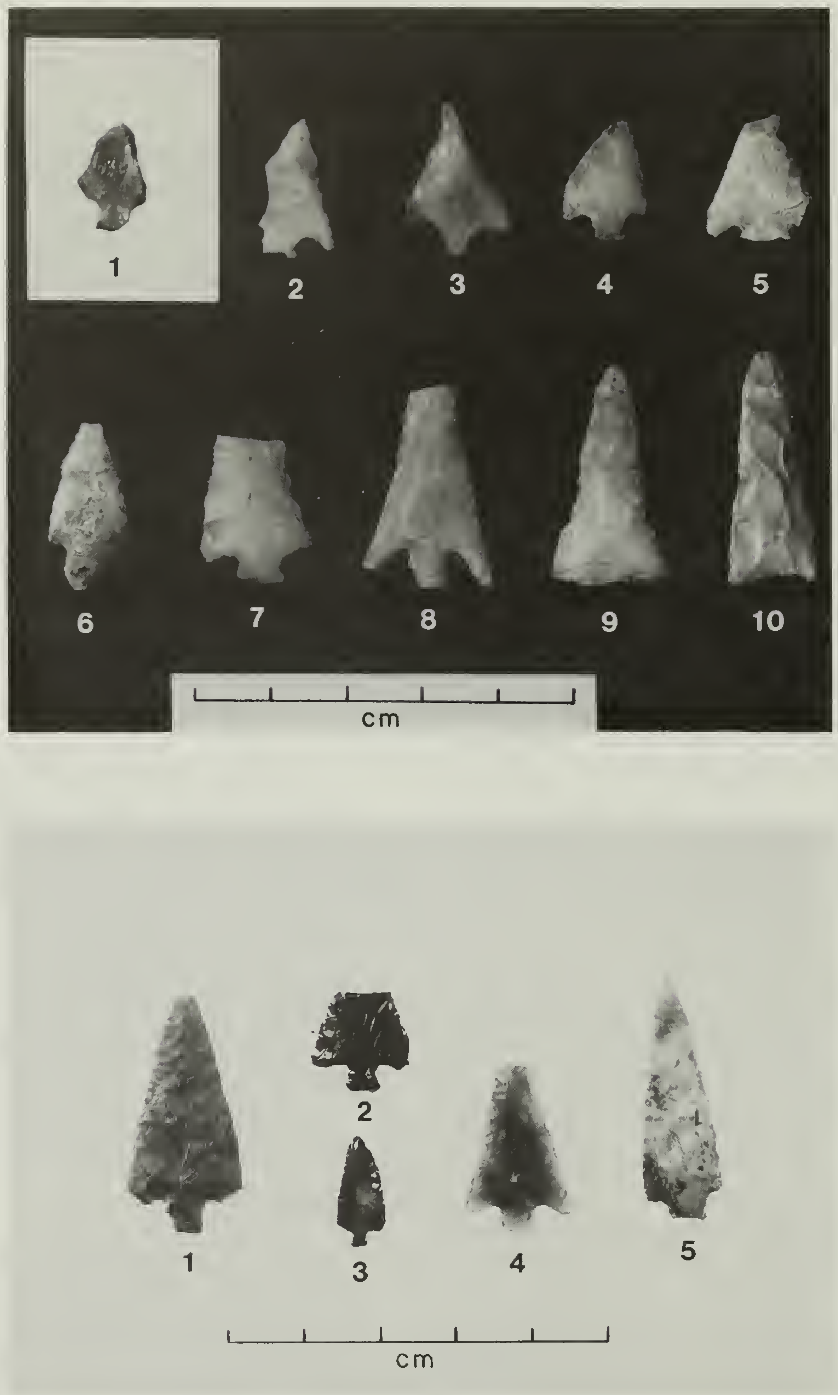
Thus, an ideal formal series can be described by 1) development of notching from broad and shallow to narrow and deep (Forms B through D), and 2) a shift in blank form from rounded to flat based (Forms D through F). These two trends account for the transformation from corner to side-notched at Chaco Canyon sites.

The formal series shown in Figure 4.1 may be evidence of gradual, internal development in Anasazi point styles. Did this idealized developmental sequence have any real relation to prehistoric criteria for point design? The sequence shown is purely formal and has not been related to function, or any of the many possible social correlates of style. Form indeed changed through time, but I do not see any easy equation of formal change with functional change (all these forms are, after all, simply arrow points), or other factors such as group identity (e.g., Judd 1954: 254-255).

More importantly, side-notching in Anasazi points has also been argued to reflect a general north-to-south continental diffusion of this type of hafting (Brugge 1981b:283); and a casual examination of the Mesoamerican literature suggests that side-notching "reached" or was adopted in central Mexico several centuries after its appearance in the Anasazi area. There is a plausible argument for the diffusion of this point style from north to south; plausible, that is, if it can be demonstrated that side-notching had some universal advantage over the myriad of hafting types it replaced. This is an intriguing question that, unfortunately, cannot be pursued further here.

<u>Dimensions</u>

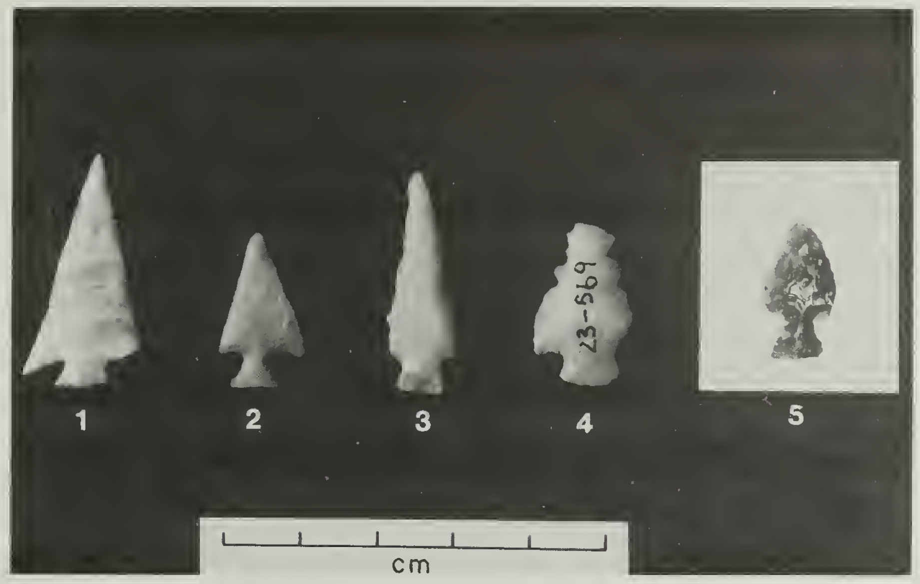
Selected measurements for arrow points are given in Table 4.4. Other measurements, particularly detailed haft measurements, show extremely little variation within or between types and are omitted here (see Lekson 1980a). Greatest variation comes in blade length, which can vary freely, independent of the arrow construction and hafting considerations. Using a sledgehammer to swat a fly, I tested correlations of the measurements in Table 4.4 and found that although haft-related measures were all very strongly correlated with each other, there was little or no correlation of blade length and haft



A

B

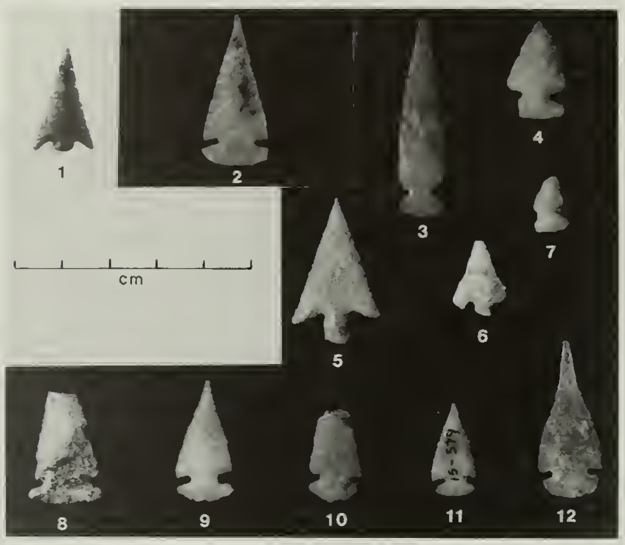
Figure 4.3. Projectile points from well-dated contexts, Chaco Project excavations. Early Basketmaker III. A) All from 29SJ 423. (NPS Chaco Archive Negative No. 19325). B) All from 29SJ 423. (NPS Chaco Archive Negative No. 19326).



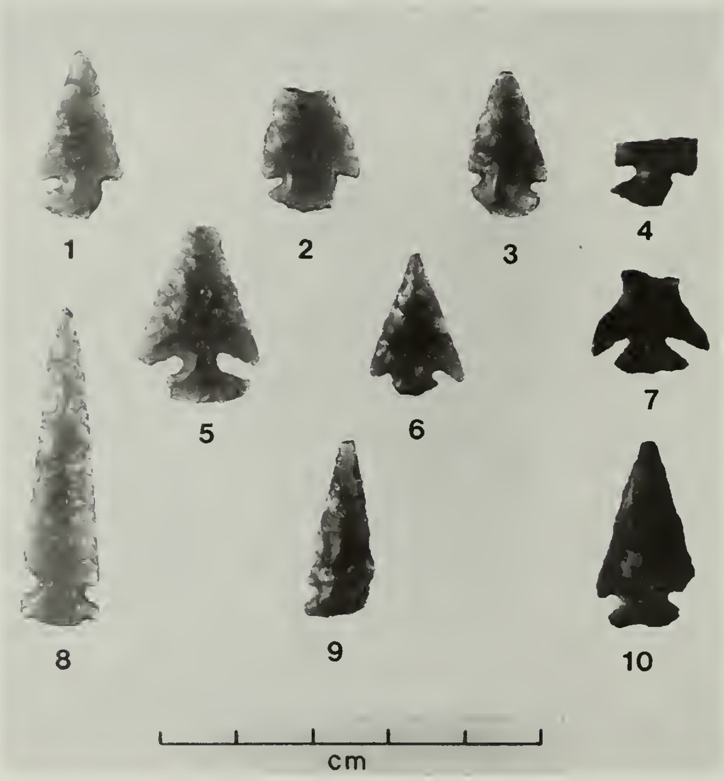
C

D

Figure 4.3. *Projectile points from well-dated contexts, Chaco Project excavations. C) Middle-late Basketmaker III: 1 and 2 from 29SJ 1659, 3 from 29SJ 628, 4 and 5 from 29SJ 724. (NPS Chaco Archive Negative No. 19335). D) Late Basketmaker III: 1 and 3 from 29SJ 724, 2 from 29SJ 628. (NPS Chaco Archive Negative No. 19329).*



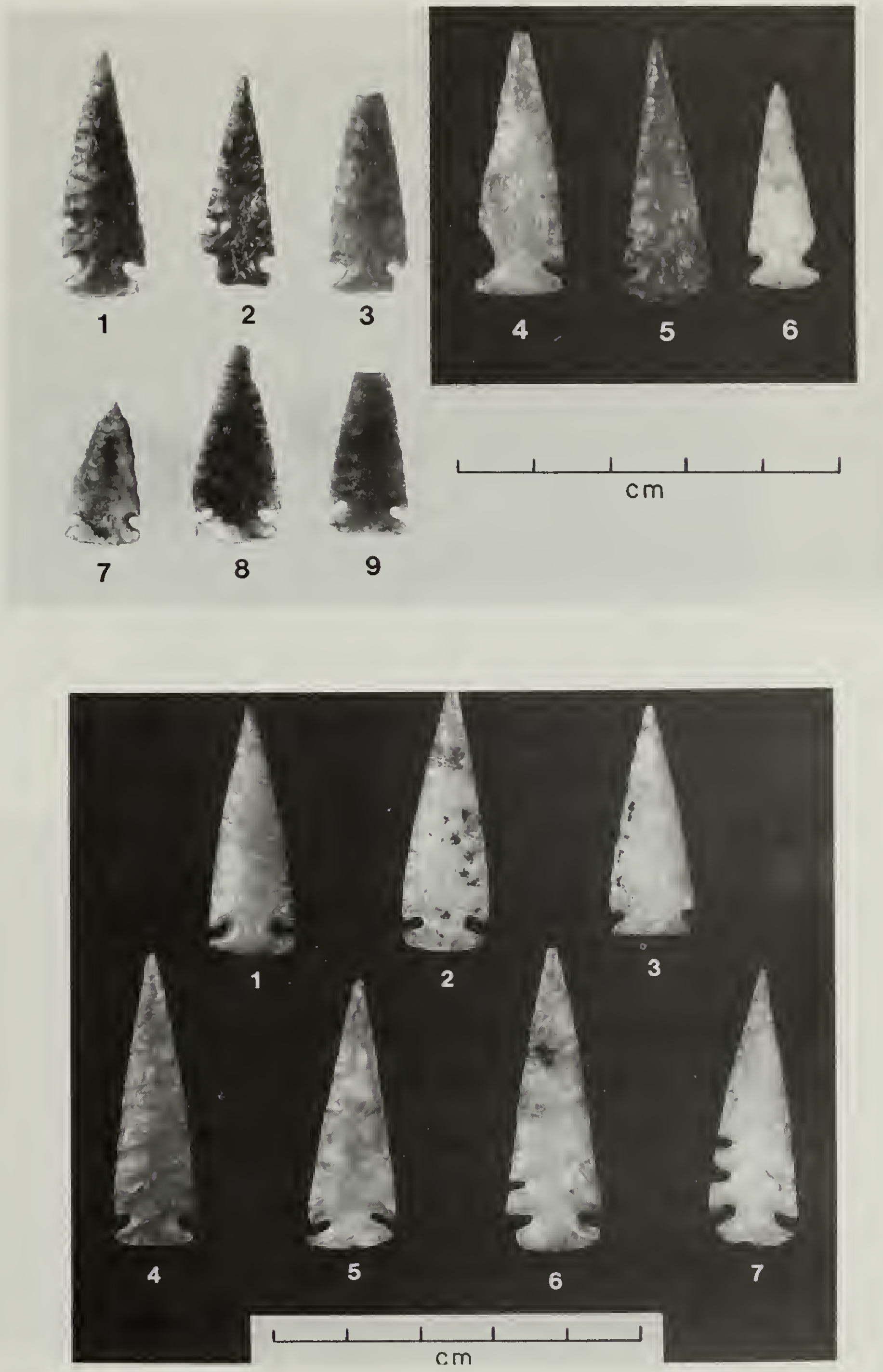
E



F

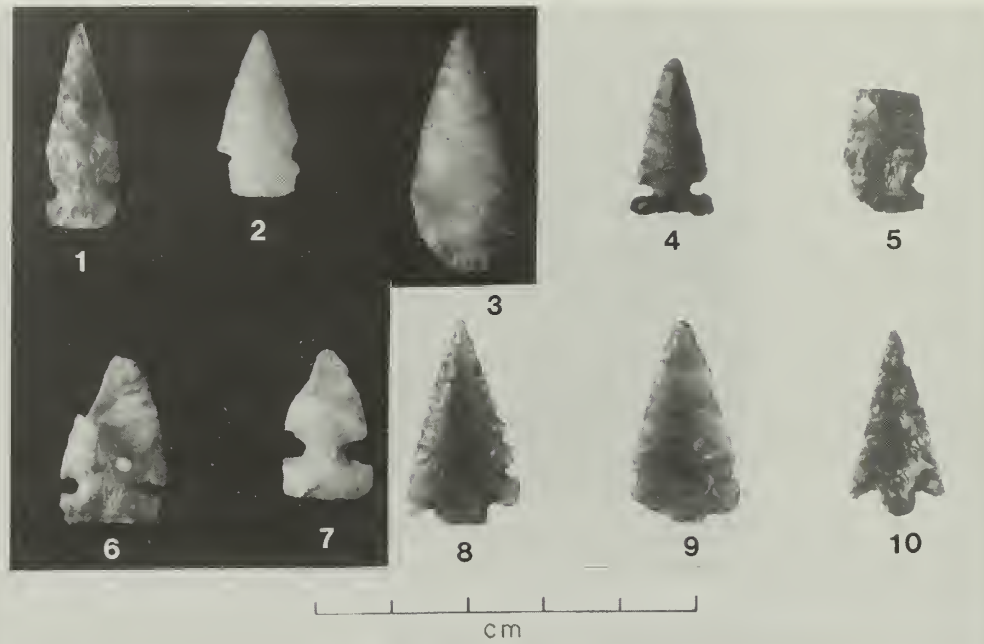
Figure 4.3. Projectile points from well-dated contexts, Chaco Project excavations. Early Pueblo II. E) 1, 4, 5, 6, 7, and 9 from 29SJ 629; 2, 11, and 12 from 29SJ 1360; 3 from 29SJ 391; and 10 from 29SJ 389. (NPS Chaco Archive Negative No. 19332). F) 1, 4, 5, 7, and 10 from 29SJ 629; 3 and 8 from 29SJ 629; 6 from 29SJ 626; and 9 from 29SJ 1360. (NPS Chaco Archive Negative No. 19339).

G

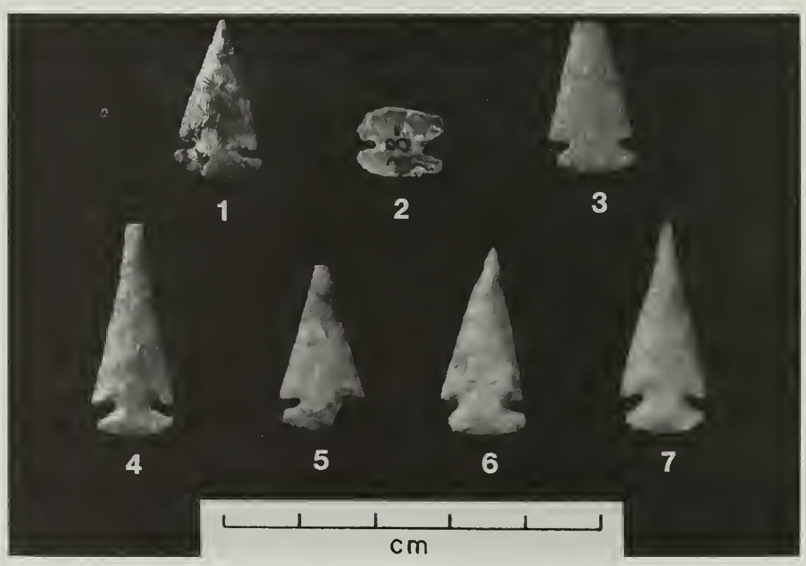


H

Figure 4.3. *Projectile points from well-dated contexts, Chaco Project excavations. Early Pueblo II. G) 1, 8, and 9 from 29SJ 627; 2 from 29SJ 389; 3, 6, and 7 from 29SJ629; 4 from 29SJ 1360; and 5 from 29SJ 391. (NPS Chaco Archive Negative No. 19327). H) 1 from 29SJ 391; 2 through 7 from 29SJ 627. (NPS Chaco Archive Negative No. 19337).*



I



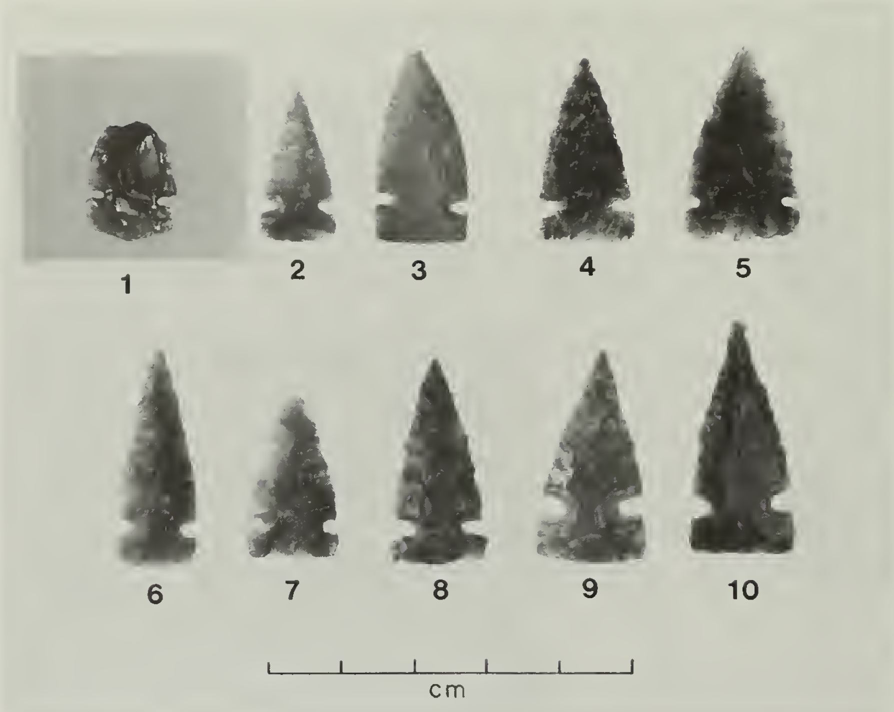
J

Figure 4.3. *Projectile points from well-dated contexts, Chaco Project excavations. Late Pueblo II. I) 1, 2, 5, 6, and 7 from 29SJ 389; 3, 4, 8, 9, and 10 from 29SJ 627. (NPS Chaco Archive Negative No. 19333). J) All from 29SJ 389. (NPS Chaco Archive Negative No. 19328).*

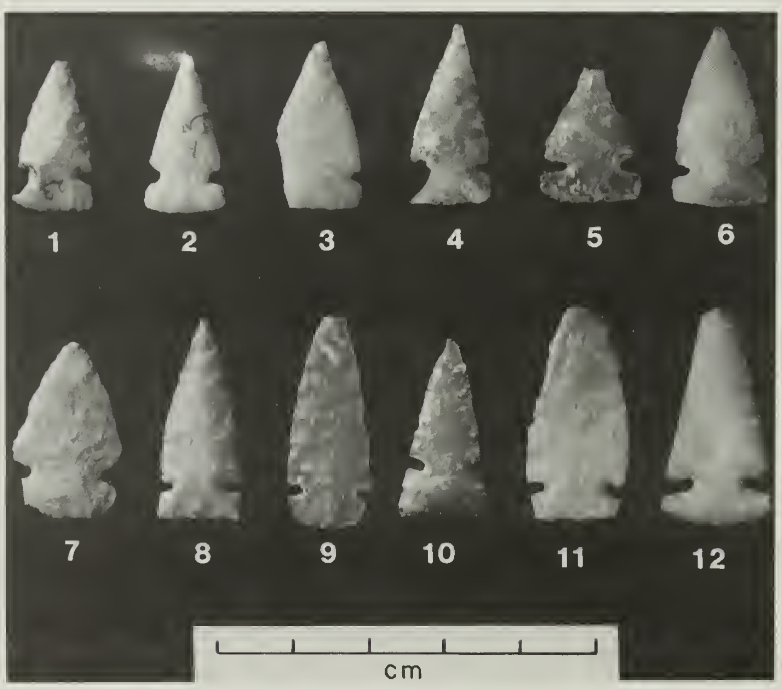
K

L

Figure 4.3. *Projectile points from well-dated contexts, Chaco Project excavations. K) Late Pueblo II. All from 29SJ 389. (NPS Chaco Archive Negative No. 19334). L) Early Pueblo III. All from 29SJ 389. (NPS Chaco Archive Negative No. 19336).*



M



N

Figure 4.3. *Projectile points from well-dated contexts, Chaco Project excavations. Early Pueblo III. M) 1 through 8 from 29SJ 389; 9 and 10 from 29SJ 391. (NPS Chaco Archive Negative No. 19338). N) 1, 2, 4, 7, 8, and 10 from 29SJ 391; 3, 5, 6, 9, 11, and 12 from 29SJ 389. (NPS Chaco Archive Negative No. 19330).*

Table 4.4. Mean arrow point measurements (in mm).[a]

	Stemmed	Corner-notched	Side-notched
Blade length	20.54	21.08	19.79
s.d.	6.42	6.38	5.34
N	55	154	252
Base length	4.91	4.67	5.46
s.d.	2.10	1.15	1.51
N	55	161	268
Shoulder width	13.73	12.71	11.78
s.d.	3.94	2.79	1.71
N	60	163	268
Min. stem diameter[b]	5.35	6.72	7.47
s.d.	1.66	1.52	1.32
N	60	164	272
Base width	5.69	10.78	12.52
s.d.	2.66	2.23	2.16
N	58	161	266
Weight[c]	8.18	8.86	7.34
s.d.	8.74	7.52	3.78
N	38	96	183

[a] Blade length and base length defined by the point on that long axis of the blade crossed by the minimum stem diameter. Shoulder width is the width of the blade immediately above the stem or notches. Minimum stem width is the width of the stem just below the blade, or the shortest distance between the two notches. Base width is the width of the base of the stem, the width of the proximal end of notches (on corner-notched points), or the width at the juncture of base and blade below the notches (on side-notched points).
[b] Minimum stem width distribution is truncated at 10 mm by definition.
[c] In 0.1 grams.

measures. Blade length varies more or less randomly within the observed range. (Because all this is intuitively obvious, the details of those correlations are omitted here.)

Weight

Weight is an important consideration, but by no means the controlling or critical factor in projectile point design. The mean weight of complete arrow points was about 8 grams. Although the arbitrary typological cutoff at 10-mm-stem-width will, of course, truncate the upper end of weight distributions, it is probably still significant that all three formal types weigh about the same, with no significant differences between the three means (Table 4.4).

Hafting dimensions and base size were probably closely related to the growth characteristics of the reeds used for arrow shafts, resulting limits of foreshaft size, and perhaps the characteristics of available bow woods. The stone tip of the arrow was probably secondary in functional importance to the arrow itself, a fact attested by the identical construction of arrows with wood tips and arrows with stone points at Chaco Canyon and elsewhere in the San Juan area.

Material

Somewhat different kinds and proportions of materials are represented in the excavated sample of arrow points (Table 4.5) than in the excavated tools and the total excavated lithic assemblage (Cameron, this volume). As noted previously, there is a relatively greater variety of tool types in the excavated sample than in the rest of the study collection, which is predominately arrow points. Within the class of arrow points, however, there is a much greater variety of materials (and particularly unusual cherts and chalcedonies) in the larger study collection than in the excavated sample of arrow points.

Table 4.5. Arrow point material types, entire collection and excavation.

		Entire Collection		
	Excavated[a]	Stemmed	Corner-notched	Side-notched
Morrison Formation materials	9.5	10.0	8.6	15.9
Yellow-brown spotted chert	0.8	1.7	0.6	-
Washington Pass chert	0.4	3.3	4.9	2.2
Zuni wood	-	-	-	0.4
Obsidian	24.5	16.7	20.7	15.2
High surface chert	25.3	3.3	0.6	5.4
Cherty wood	4.6	5.0	2.4	9.8
Splintery wood	-	-	-	-
Chalcedonic wood	10.8	23.1	15.9	14.2
Quartz	0.4	-	-	-
Other	23.7	36.7	46.3	36.9
Miscellaneous fossiliferous chert		-	0.6	0.4
San Juan fossiliferous chert		5.0	-	-
High surface quartz sandstone		-	-	0.4
San Juan shale		-	0.6	-
Pedernal chert		1.7	-	1.1
Laguna chert		-	3.7	0.7
Miscellaneous cherts		6.7	12.2	10.5
Miscellaneous chalcedony		23.3	24.4	23.8
Vitrophyre		-	1.8	-
Totals %	100.0	99.8	100.0	100.0
N	241.0	79.0	215.0	364.0

[a] Excavated points, tool types 202-207 (Cameron, this volume).

Manufacture

Over 97 percent of the arrow points were made on flake blanks, and over 98 percent of the points indicated there was no evidence of techniques other than pressure-flaking. This technological evidence will be important in our interpretation of the generalized bifaces classified here as knives.

Patterns of Breakage

The collection shows an intriguing pattern of breakage (Table 4.6). About half of the points are complete and apparently serviceable. Breakage is mainly of two types: first, the tip of the point is broken off; or second, the points break at the minimum stem-width, creating two fragments, the base (proximal) and the blade (distal). About one-quarter of the points in the collection have broken tips. The number of tips (classified as "miscellaneous tool fragments" and not included with arrow points) is slightly less than half the number of points with broken tips. Either the tips were winding up in different contexts than the points from which they came, or there is a difference in archeological recovery. Because point tips are usually tiny triangular fragments—inconspicuous at best—the latter seems likely. This suggests that point tip fragments are greatly under-represented in our collection, particularly in surface and older museum collections.

Less easily explained is the discrepancy between the numbers of blades and base fragments of points

Table 4.6. Condition of arrow points.[a]

	Complete	Broken tip	Blade	Base
Whole collection	47.5	25.9	26.0	0.6
Excavated only	46.5	22.4	29.9	1.2

[a] "Blade" means distal portion of point broken at minimum stem diameter. "Base" means proximal portion of same. Values are percentages of all points in two samples.

broken at the minimum stem-width (Table 4.6). Although blade fragments are common, base fragments are rare. There are almost 45 blade fragments for each base fragment. We can, I think, discount some problems of recovery that might have affected point tip fragments. From my experience, base fragments are more likely to be collected in surface surveys, etc., because of their eye-catching shape. A point tip is simply a triangular fragment; bases are symmetric, complex and unnatural shapes. They stand out. In my opinion, the ratio of bases to blades in the entire collection is a roughly accurate reflection of the real distribution. This opinion is supported by comparison of blade and base fragment frequencies in excavated samples versus the entire collection (Table 4.6).

The base of a mounted point, breaking at the minimum stem-width, would probably remain in the foreshaft of the arrow. An arrow with a broken point could be retained, if possible, and rearmed. The broken distal end of the point, if sufficiently large, could also be salvaged, reworked, and rehafted, but only 16 items in the collection (less than 10 percent of all point fragments) are renotched blade fragments (tool type 218, Cameron, this volume; Figure 4.3, F8, G5, and I5). Whatever the recycling possibilities for blade fragments, there would be little further use for the base fragments. These, presumably, would be removed and discarded when the arrow was rearmed.

Why, then, are there so few base elements? Rearming could have occurred in the field, away from the habitation sites; bases would then be discarded away from residential areas and would not be represented in our collections. I suspect the real answer is more complex. There is an intriguing metrical difference of most measurements between whole points and blade fragments. Differences of means of these measurements are significant at the 0.01 level in almost every case; the few that are not different at the 0.01 level are different at the 0.05 level (Lekson 1980a). The metric data suggests that the complete points and the blade fragments are from two different populations.

An intriguing possibility is suggested by the differences between blade fragments and whole points. If the blade fragments were, in fact, from a different population than the Chaco points, the lack of base elements might indicate that the points were, indeed, being broken elsewhere and the blade fragments were arriving in Chaco Canyon incidental to other concerns. Specifically, blade fragments might have come into the canyon embedded in meat. Akins had argued that meat was traded into the canyon (Akins 1982, 1985), and depending on the form in which it was processed and transported, arrow point blade fragments might have been left in, like shot in a game bird, to be removed later.

It is difficult to assess this suggestion. Formally, the blade fragments are very much like the blades of complete points; there are no obvious formal distinctions beyond size. The material types in both blade fragments and complete points are very similar. While complete arrow points show a ratio of local to exotic materials of about 60:40, the material types represented by blade fragments are closer to 50:50. This difference is not compelling evidence for different areas of manufacture, or use by different groups.

It is interesting to note that studies at Salmon Ruin (Moore 1981; Shelley 1980) demonstrated that arrow points within the same general types and time periods fall into regional groups (e.g., Salmon, Chaco, Mesa Verde, etc.), based on discriminant functions that include metric attributes. Even though it is not possible to decode the discriminant functions (to see, for example, if Salmon arrow points were smaller than Chacoan arrow points), these analyses suggest that there are significant differences of dimension (as well as other, nonmetric attributes) between contemporaneous regional point populations; regional "styles" which would be lost under the three-type system. Although these analyses do not resolve the present question, they offer at least indirect encouragement to the view suggested above.

Points from Burial 10, Pueblo Bonito

One group of arrow points stands remarkably apart from the rest of the collection. There are two

lots of points associated with Burial 10, Room 330 at Pueblo Bonito (Judd 1954:254-255, 333; Plates 73A, 74, 98 lower). Burial 10 had 16 points mounted on arrows in a quiver and 28 points arranged in a triangular cache or offering near the body. Judd saw little of unusual interest in these points; all could be called either corner- or side-notched and he included them with other Pueblo Bonito points in his discussion of those two types.

On re-examination of these points, however, they seemed remarkably unlike the other points from Pueblo Bonito and the rest of the Chaco collection (a selection of these points is shown in Figure 4.4). The differences were obvious—larger size, deeper notches, unusual base forms, serrated blade edges, etc.—but this could be demonstrated only with difficulty in the formal analysis. A more detailed metric analysis of notch form compared these points to other points from Pueblo Bonito and a sample from the Chaco Project excavated sites (Farrel 1980). This analysis demonstrated statistically significant differences in notch depth and angle between the Burial 10 points and the other two samples, but no statistical differences between the other two groups.

The most dramatic formal differences between the Burial 10 points and the other Chaco points was not in the differences between any single measure but rather the variety of unusual forms with the burial, forms that did not appear in the rest of the collection. For example, the pointed-base, side-notched points found in both the quiver and the cache with Burial 10 (Figure 4.4b) are not seen anywhere else in Chaco Canyon sites. Similarly, the deeply corner-notched points with serrated blades (Figure 4.4a) are unique in Chaco Canyon (moreover, they are made of the same fossiliferous chert that so perplexed Judd in the large blades from Kiva Q, described below).

This variety suggested a number of different knappers. Bradley examined the points and identified 13 groups within the two Burial 10 lots and tentatively suggested that at least five different knappers were represented, with all five contributing arrow points to both Burial 10 lots (Bradley 1980). One common characteristic of the points is their excellent workmanship; all five knappers were experts at their craft. Bradley's opinion is important to any interpretation of the grave goods from this unusual burial at Pueblo Bonito. Burial 10 was accompanied by a variety of highly distinctive, extremely unusual, very well-made arrow points, almost certainly made by several different craftsmen.

Who was Burial 10? Judd spun an ingenuous tale about a middle-aged warrior, "an honored defender of the village," leading the "remnant stubbornly clinging to its ancestral home" against "the attacks of enemy raiding parties" (Judd 1954:254, 333). This is possible. He might have been the last war chief, or he might have been a prehistoric gun-nut, a connoisseur of fine foreign spikes. In the context of the collection, the arrow points with this gentleman were clearly remarkable, but I am not prepared to guess what that means.

<u>Other Unusual Arrow Points</u>

Two other point types, both rare in the collections, deserve mention. The first one came from Pueblo Bonito, probably from trash deposits in the south end of Room 251. It is shown in Judd (1954:Plate 73B—"Miscellaneous arrowheads, including those of aberrant form"). This point (our Figure 4.12G) is a Neff point (Wiseman 1971), named for the Neff site about 12 miles south of Roswell, in southeastern New Mexico. Wiseman dated the site to between A.D. 1000 and 1200. The distribution of Neff points is generally limited to southeastern New Mexico, south of Fort Sumner and east of the Sacramento Mountains.

The second is a group of unusual points that have deeply concave bases and an extremely convoluted provenance. Two points, notably different from the rest of the collection, were found on the surface of trash areas at Bc 51 (Figure 4.5A). The points are very well-made on a white chert, which is probably local. Their bases are deeply concave, producing a haft element that is forked, or lobed, in appearance. The blade of at least one, and perhaps both, is roughly serrated. The form is quite distinctive and, perhaps, quite important.

This form was not uncommon in other areas of the prehistoric Southwest. The deeply concave base (without the serrated blade) is common in late Pueblo III and Pueblo IV contexts in the Hopi area (Woodbury 1954:124-147; Figure 25a-i), and may be specific to that part of the Anasazi area. It is also known in Utah and northwestern and western Arizona, where it continues from the late prehistoric to historic times (Pilles 1981). Forms closely

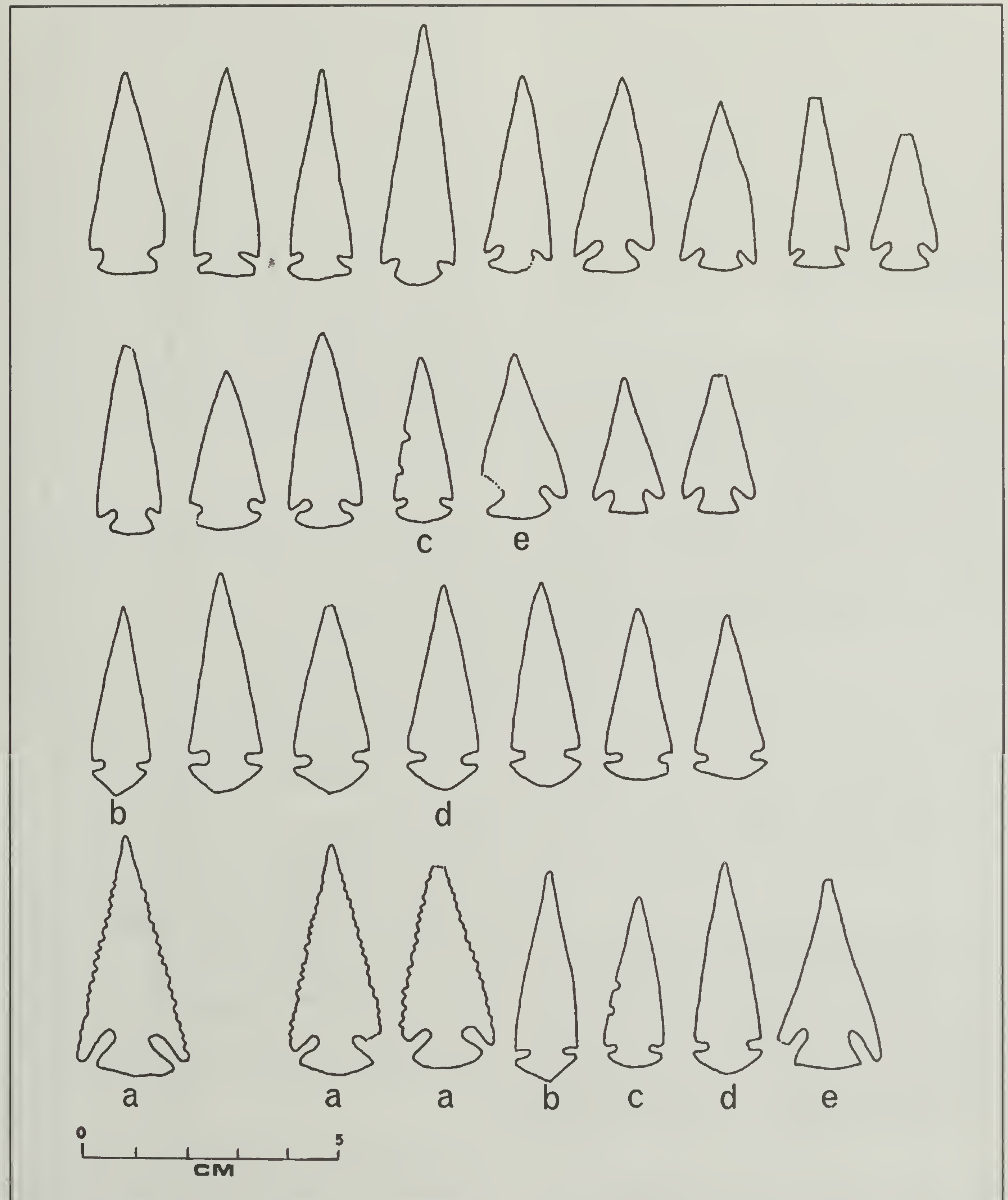


Figure 4.4 Selected points from Burial 10, Room 330, Pueblo Bonito. First three rows, first point in fourth row: cache between knees. Second through seventh points, fourth row: quiver. Compare pairs of points indicated by letters.

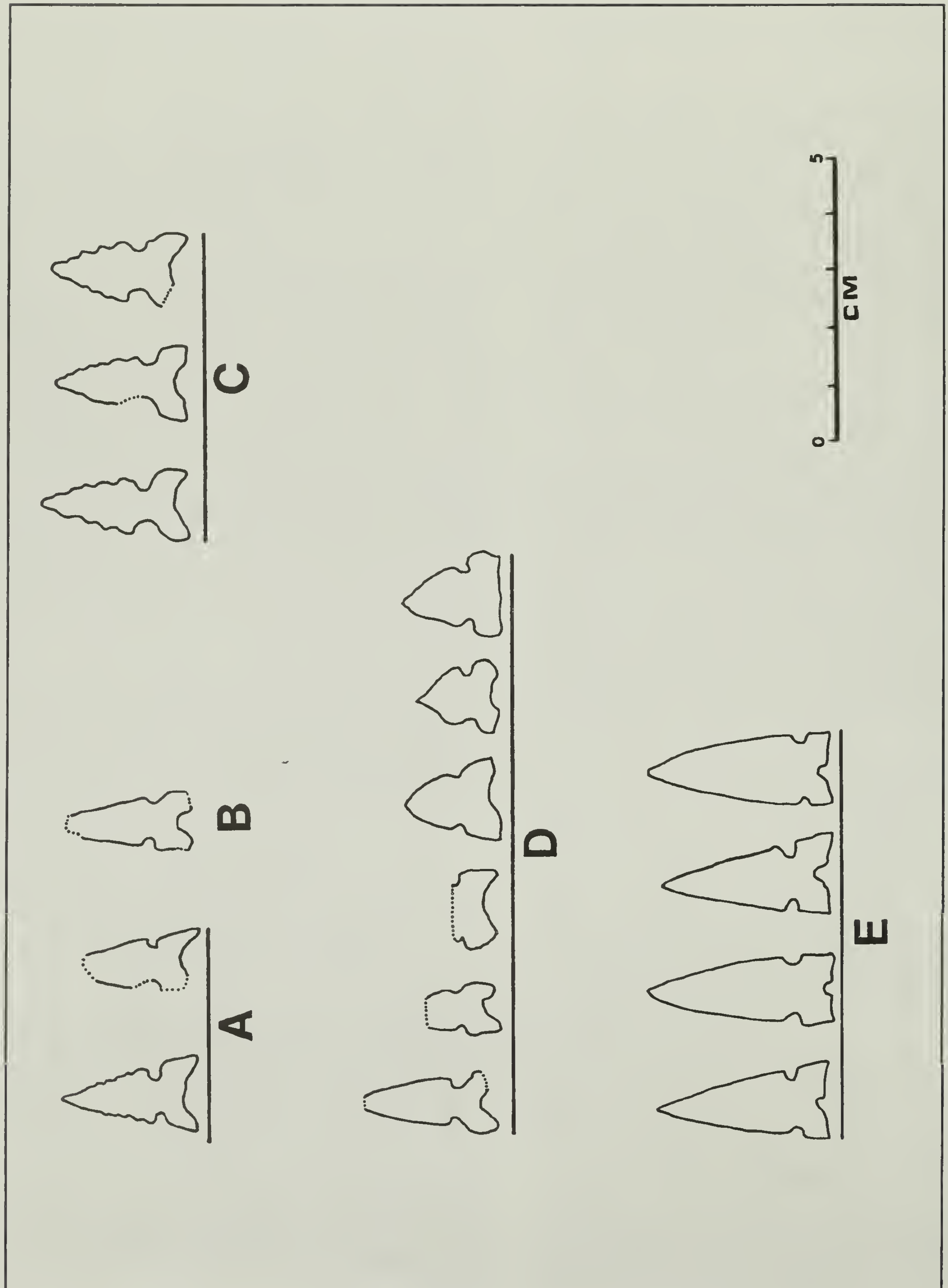


Figure 4.5. Points with concave bases. A) Bc 51, east trash. B) Pueblo Bonito, Kiva B. C) Points from Casas Grandes (after Rinaldo 1974:392 upper left, upper row). D) Selected points from 29SJ 1613. E) Point cache from 29SJ 1365.

resembling the Bc 51 points are also known from southeastern New Mexico and trans-Pecos Texas, where it has been named the "Toyah point" (Suhm and Krieger 1954:508; Bell 1960:88). The Bc 51 points are nearly identical to published illustrations of Toyah points, but evidently do not completely duplicate the type as currently understood (Robert Mallouf, personal communication, 1985). Deeply concave based, side-notched points in all these areas probably post-date the Anasazi occupation of Chaco Canyon. Perhaps most intriguing, points identical to those from Bc 51 were the most common type of arrow point at Casas Grandes (Rinaldo 1974:392). The excavations at Casas Grandes produced about 86 tools that would be classified here as arrow points; 43 of these were very similar to the two from Bc 51. The resemblance is striking; compare Figure 4.5A with Figure 4.5B, a series of points from Casas Grandes.

Muddying the already murky waters is a second group of points with deeply concave bases from Chaco Canyon, found during the excavation of 29SJ 1613, an eighteenth century Navajo site (Brugge 1986). These small, side-notched points have very distinctive, deeply concave bases, giving the base the appearance of two lobes (Figure 4.5D). At least one point, identical to the early Navajo points, was found at Pueblo Bonito (Figure 4.5B). This should not be surprising in view of the probable Navajo reuse of open rooms at that site and others in Chaco Canyon (Thomas Windes, personal communication, 1985).

These points are of intrinsic importance in that they are quite unlike the commonly accepted Navajo forms (e.g., Vivian 1960; Chapman 1977:Figure 11.11 illustrates "Navajo" points that are almost certainly Archaic points, related to Chiricahua forms). For the present argument, they are of interest in their implications for the points found at Bc 51. Are the "Casas Grandes" points at Bc 51 actually Navajo? I believe they are not. There are clear differences between the points from 29SJ 1613 and the Bc 51 points; most notably the Bc 51 points are more well-made.

Out of this small sample, how important are differences in workmanship? There is no ready answer to this question. Instead, we can only add ambiguity to the problem by introducing yet another (survey) find, a cache of four points from 29SJ 1365. These four points were found on a Navajo site in association with other artifacts that suggested "a portion of a medicine bundle. The cache of four points is suggestive of something that might once have been in a pollen bag or otherwise wrapped for inclusion in a set of ceremonial objects" (Brugge 1981a:91). These points are very well-made indeed. They are nearly identical in shape and flaking, are all of the same white chert and give every appearance of being made by one knapper. Most significantly, they all have notched bases—not concave, but an unusual treatment in Chaco Canyon and suspiciously suggestive of the early Navajo points described above.

In all respects except the notched base, the points from 29SJ 1365 are textbook examples of Pueblo III points. In fact, Brugge (1981a:91) implied that these were Anasazi points reused by the Navajo in a ceremonial context. This is quite likely; Navajo ceremonial reuse of Anasazi points is well known (and in fact, seriously impinges in the validity of chipped stone assemblages at sites the Chaco Project excavated with the help of local labor; Thomas Windes, personal communication, 1985). "It should be noted that only unbroken projectile points are considered by the Navajo as suitable for such use" (Brugge 1981a:91).

(On a related subject, Bradley noted that about one-fifth of the obsidian points in the larger collection—not the 29SJ 1365 points—showed evidence of surface abrasion and grinding, along with crushed and battered edges. He suggested that this, too, was possible evidence of these points being carried in medicine bundles or pouches (Bruce Bradley, personal communication, 1979).

Arguing against this interpretation of the 29SJ 1365 points is the compelling evidence that the points were made by one knapper. This would require that the Navajo found an Anasazi "cache" of unusual points—by no means impossible, but unparsimonious. Alternately, Brugge has later suggested that these might, indeed, be Navajo points, unusually well-made precisely because they were intended for a "medicine bundle" (David Brugge, personal communication, 1985).

It is difficult to ignore the possible implications of these points for the Bc 51 points, if workmanship is a criterion for separating Anasazi and Navajo materials. In my opinion, the points from 29SJ 1365

are a reused Anasazi cache and the two points from Bc 51 are 500 years earlier than and (perhaps) 340 miles distant in inspiration from the Navajo points from 29SJ 1613. Other interpretations are clearly possible. I have tried to set forth the facts affecting the case; cautious readers will keep their own counsel.

Knives

"Knives" is a term of convenience for bifacially flaked blades without hafting elements. These make up 17 percent of the collection. In Neil Judd's day, knives could range from finely made, reused Archaic points to roughly retouched flakes, as well as tools fitting our definition (Judd 1954:Plate 28). Our definition is perhaps exclusive, but still embraces tools that probably had a wide variety of functions. Less than 6 percent of the tools classified as knives had bifacial edge damage, which might indicate use as a knife. In fact, only a few exhibited any kind of damage; over 90 percent of our knives showed no signs of use. Did these, in fact, function as knives?

The subdivision of bifacially flaked blades into quasi-functional categories is anything but straightforward; so following our initial formal division of hafted versus non-hafted tools, hafting modifications were analyzed as a class. To anticipate our conclusions, I see three non-knife divisions within this artifact class: 1) small knives (probably arrow point blanks), 2) medium-sized knives found mainly in pre-Pueblo period contexts (probably biface blanks), and 3) large, very well-made bifaces from Pueblo Bonito and Pueblo del Arroyo. To arrive at "real" knives is a process of exclusion and when everything else is excluded, there are very few knives left.

Almost all knives had a distinct base with a clear juncture between base and blade. Twenty percent were flat, 50 percent were rounded to various degrees and the remaining 30 percent were pointed, concave, or a variety of odd other shapes (Figure 4.6).

Arrow Point Blanks or Small Knives?

Most typological "knives" may not have been functional knives. According to Bradley, less than a third of the knives represented finished pieces; the remainder were, in his judgement, unfinished. The majority of primary shaping (65 percent) was by percussion; pressure-flaking was used for finishing in most cases, but recall that most knives were unfinished. There is a clear relationship between small size and pressure-flaking in knives. Indeed, most of the smaller knives made on flakes and shaped with pressure-flaking are probably arrow point blanks.

Complete arrow points averaged about 26 mm in length, while the mean and mode of knives was 32 mm (Table 4.7 and Figure 4.7). Because of high outliers, almost 70 percent of all knives have a maximum length smaller than the mean. Without outliers over one standard deviation above the mean, the mean length of knives complete enough to measure was 27 mm (s.d.=11, N=81), almost exactly the same length as arrow points. In fact, most knives are small enough to suggest that with some further reduction (through pressure retouch?), they would closely approximate arrow points in size. The range of materials used in knives (Table 4.8) is quite similar to that seen in arrow points. Thus, the smaller, unfinished knives could be arrow point blanks. Very few arrow points, however, showed any evidence of percussion-flaking, while two-thirds of the Chaco Project knives were initially shaped by percussion. It is possible, and even likely, that subsequent pressure-shaping and finishing removed evidence of earlier percussion work. Thus, all of the smaller knives with pressure-flaking and many of the smaller knives with initial percussion-flaking could have been, and probably were, arrow point blanks. This could include up to about 60 percent of the knives in the collection.

Table 4.7. Mean knife measurements (in mm).

	Mean	s.d.	N
Blade length	31.7	16.0	86
Base width	17.9	8.0	210
Maximum width	21.1	10.5	258

Medium-sized Knives or Biface Blanks?

What about unfinished pieces assigned to the "knife" category that are too large to be arrow point blanks? Arrow points range up to about 38 mm in

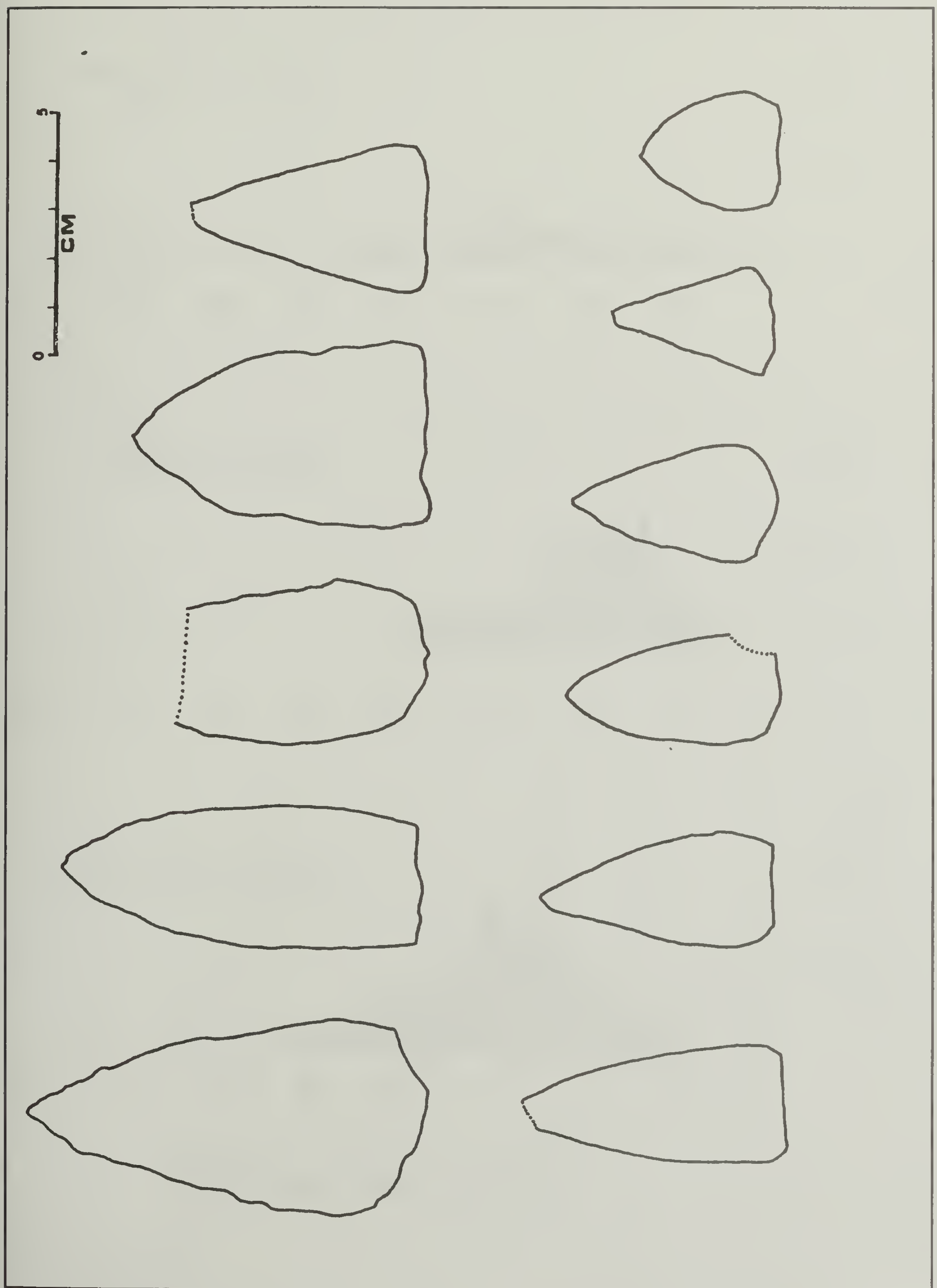


Figure 4.6. *Knives. Top row, left to right: 29SJ 2058; Pueblo Bonito, Room 334; 29SJ 629, FS 2336, 29SJ 628, FS 207; 29SJ 721, FS 92; no provenience (C1957); Bc 50; no provenience (C1958); 29SJ 2249; Bc 51; Bc 50.*

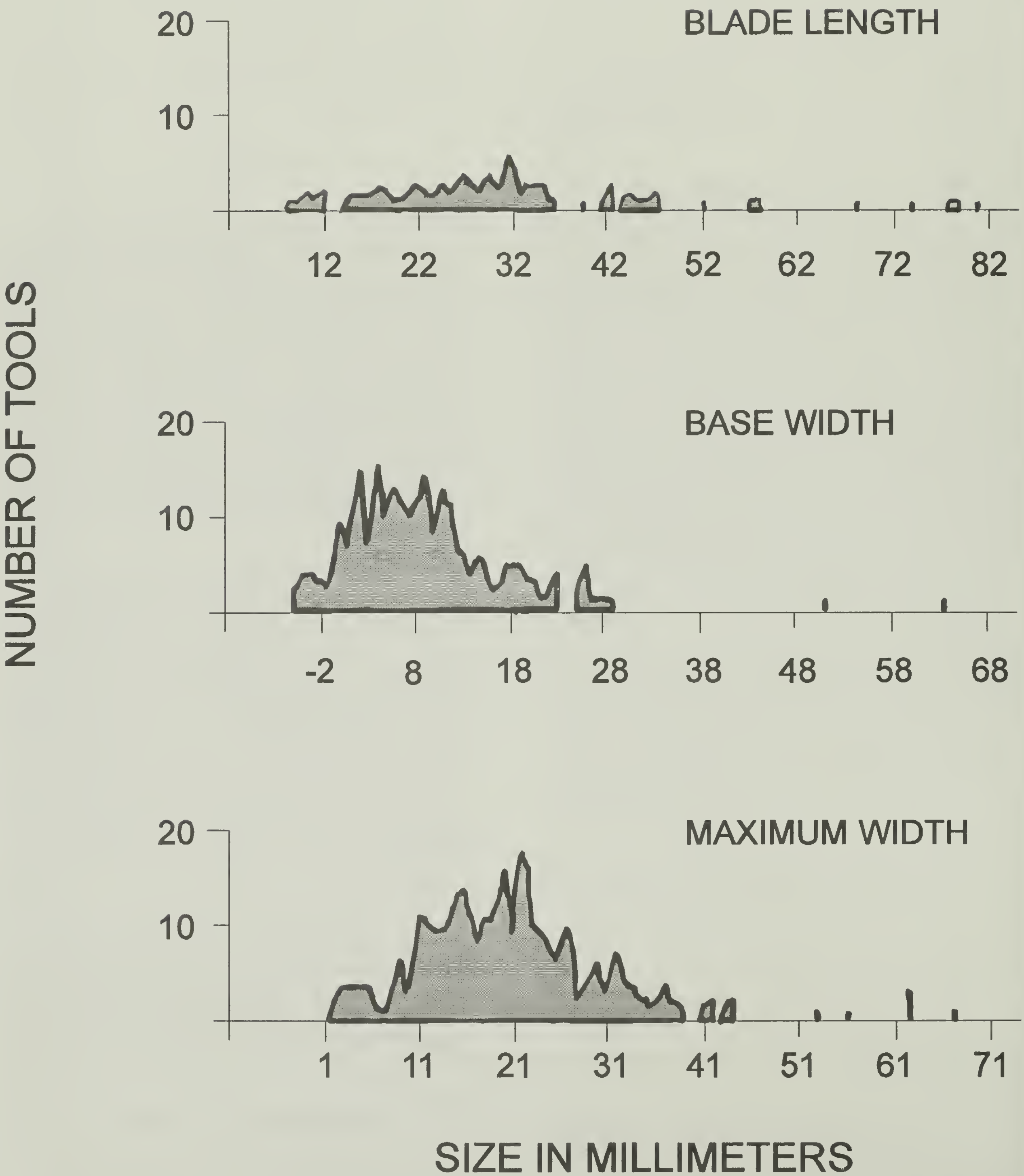


Figure 4.7. Mean knife measurements.

Table 4.8. Material types for various types of knives.

Material Type		No. of knives				
		Heavy projectile point (dart point) or knife	Light unhafted projectile point or knife	Heavy unhafted projectile point or knife	Backed knife	Total
1010	Chert, fossiliferous, undifferentiated	2	3	4	-	7
1011	Chert, fossiliferous, cream to light red	4	1	1	-	6
1014	Chert, chalcedonic, may be banded, varicolored	8	1	9	-	18
1022	Chert, clastic, containing scattered quartz grains, creamy-white to light green	3	1	1	-	5
1030	Chert, black, undifferentiated	-	-	1	-	1
1040	Chert, green, cream, glossy to dull luster, Brushy Basin	4	1	7	-	12
1041	Chert, mottled pink	1	-	-	-	1
1042	Chert, red, gray, purplish; glossy luster	1	-	3	-	4
1050	Chert, white, miscellaneous	4	2	7	-	13
1052	Chalcedony, clear, miscellaneous	5	3	15	2	25
1053	Chalcedony, clear with black mossy inclusions	3	2	15	-	20
1054	Chalcedony, high surface gravel	1	-	7	-	8
1060	Chert, dark red (jasper)	3	-	3	-	6
1070	Chert, yellow-brown, brown (jasper)	5	1	7	-	13
1072	Chert, yellow-brown, with black mossy inclusions, "Chinle"	1	2	-	-	3
1080	Chalcedony and opal, pink to pinkish-orange, Washington Pass chert	6	2	9	-	17
1098	Chert, chalcedonic	-	1	-	-	1
1099	Chert, resembles Pedernal chert	-	-	2	-	2
1109	Silicified wood, light-colored splintery, dull luster	-	-	1	-	1
1110	Silicified wood, dark colors, grays and browns, undifferentiated, dull	-	-	1	-	1
1112	Silicified wood, dark colors, waxy luster	22	1	20	2	45
1113	Silicified wood, light colors, variegated, waxy luster, cherty	18	9	13	-	40
1120	Silicified wood, red shades, undifferentiated	5	1	3	1	10
1140	Silicified wood, light colors, white, chalcedonic	15	7	24	-	46
1142	Silicified wood, light colors, variegated, chalcedonic, undifferentiated	5	-	5	1	11
1144	Silicified wood, pinkish-orange and gray, cherty	-	-	1	-	1
1145	Not described	3	-	2	1	6
1150	Silicified wood, yellow-brown, brown (jasper), undifferentiated	1	-	6	-	7
1151	Silicified wood, yellow-brown, glossy luster; no wood structure inside	1	-	-	-	1
1160	Silicified wood, light-colored, white, pink, yellow, orange, lavender, red, variegated; chalcedonic, conchoidal fracture, dull to glossy, Chinle Formation	1	-	1	-	2
1161	Silicified wood, dark red (jasper), Chinle Formation?	-	1	1	-	2
1220	Chalcedony, clear colorless with scattered yellow mossy inclusions	-	-	1	-	1

Table 4.8. *(continued)*

		No. of knives				
Material Type		Heavy projectile point (dart point) or knife	Light unhafted projectile point or knife	Heavy unhafted projectile point or knife	Backed knife	Total
1221	Chalcedony, clear abundant yellow mossy inclusions (moss jasper)	-	1	-	-	1
1230	Chalcedony, clear with sparse red inclusions	2	1	2	-	5
1232	Chalcedony, clear with scattered yellow and red inclusions	-	-	1	-	1
1255	Chalcedony, crimson, colorless banded	1	-	-	-	1
1400	Chert, undifferentiated	1	1	-	-	2
1430	Chert and chalcedony	5	-	-	-	5
1435	Chert, cream to orange and red, waxy	1	-	-	-	1
1550	Chert, oolitic	-	-	2	-	2
1551	Chert, oolitic dark brown Rio Puerco; high surface, San Juan Basin	1	-	-	-	1
1600	Chert, light gray, miscellaneous	5	1	3	-	9
1610	Chert, dark gray, miscellaneous	-	-	1	-	1
1630	Chert, cream-colored	1	-	-	-	1
2200	Quartzitic sandstone, miscellaneous	3	-	2	-	5
2205	Quartzitic sandstone, white-buff, orange, to red, or Morrison Formation, fine-grained	11	3	3	-	17
2206	Quartzitic sandstone, Baldy Hill Formation, very fine-grained, varicolored	-	-	1	-	1
2221	Quartzitic sandstone, high surface gravel, San Juan Basin, mottled gray-tan	3	1	6	-	10
2250	Siltstone, undifferentiated	-	-	1	-	1
2551	Claystones, baked clays and shales, San Juan Basin, pink-red, and white	1	-	-	-	1
3050	Basalt, aphanitic, mafic	1	-	-	-	1
3400	Basalt, finely crystalline, indurated	1	1	1	-	3
3500	Obsidian	3	-	-	-	3
3510	Obsidian, black, dulls easily, near opaque, Grants Ridge	5	4	3	-	12
3520	Obsidian, Jemez Mountains, clear with brown tinges, undifferentiated	27	2	4	4	37
3530	Obsidian, Polvadero Peak vicinity Jemez, smoky-gray with fine white inclusions, black dust	16	1	3	-	20
3550	Obsidian	3	-	-	-	3
3700	Vitrophyre, black, dense, conchoidal fracture, undifferentiated	3	-	1	-	4
4000	Quartzite, undifferentiated	1	-	-	-	1
4200	Argillite, dark gray, dull; uneven fracture	-	-	1	-	1

total length (remember, however, that arrow points are defined by an arbitrary stem-width-limit of 10 mm, which will truncate the upper end of their measurement distributions). In fact, there is an evident discontinuity in the distribution of knife lengths at 38 mm. Items longer than 38 mm represent about 10 percent of the collection.

All but eight of the larger than 38 mm knives were unfinished. Many of these pieces were made on slab cores with percussion-flaking (although most were made on flakes.) Almost all came from two excavated sites, 29SJ 116 (an Archaic site) and 29SJ 423 (an early Basketmaker III site). Although not entirely absent at Pueblo Period sites, bigger-than-an-arrow-point unfinished knives are mainly limited to two pre-Pueblo contexts, which will be examined in more detail in the respective site reports. They are probably dart-point preforms.

Finished medium-sized bifaces without hafting modification are (with a few exceptions, to be discussed below), in all probability, knives (Figure 4.6). Real knives were probably intended to be hafted in wood or other perishable handles. Surviving examples are known both from Pueblo Bonito (Pepper 1920:Figure 134) and Aztec Ruins (Morris 1919:Figure 17). This sub-set of the medium-sized knives actually show knife wear (bifacial damage, mostly parallel to the edge); the association of this size group with knife wear is significant at the 0.01 level. Other than size and wear, there is little to distinguish this group of finished knives from the smaller finished arrow point blanks. Materials, form, and technology of medium-sized knives and projectile point blanks are essentially similar.

Large Knives

Two very large knives came from Judd's work at Pueblo del Arroyo. Both obsidian knives are very well-made and both have been snapped in half (Figure 4.8E and F). While the blade portions of these knives are extremely well-finished, the bases of both are roughly finished and probably intended for hafting in a perishable handle.

Another pair of unusual large knives were found by a stabilization crew at Bc 51. These were found in a niche in the north wall of Room 45, probably a late addition to the site. In its original state, Room 45 formed the interior of the Bc 51 colonnade. The colonnade was subsequently closed with masonry and it is not clear if the niche was in the colonnade itself or in the masonry that filled the spaces between the columns. In its final form, Room 45 was crowded with features: firepits, cists, buried jars, etc. (Truell 1983:Appendix B, Table 11), and formed a suite with a featureless "storage" room. These two knives (Figure 4.8G and H) were of similar translucent white chalcedony, were precisely the same size, and were identical in flaking and form. Unlike the Pueblo del Arroyo knives, both had carefully finished round bases. Except for a very tiny portion of the tip being broken off one, there was no evidence of use on either of the pair.

Large Knives at Pueblo Bonito

I suggest that most if not all "small knives" are actually point blanks and most "medium knives" were Archaic-Basketmaker biface blanks. We can be reasonably sure that the very largest "knives" in the collection were not functional knives either. The four largest finished bifaces in the collection form an interesting class of tools that may also have had no utilitarian function, although none of the "knives" could be examined for evidence of edge damage or wear. The most spectacular examples are three large, leaf-shaped blades found in a sealed cache in the north wall of Kiva Q at Pueblo Bonito (Judd 1954:323-324, Plate 90). Judd called these remarkable objects "knives" and the term is probably as useful as any. To my knowledge, the only Southwestern pieces that resemble the Pueblo Bonito "knives" are two "exceptional specimens" of Alibates chert found with a Pueblo IV burial at Pecos (Kidder 1932:34, Figure 16), and another of a material like the Pueblo Bonito examples from Utah (Judd 1954:129-130).

Judd waxed eloquent over the workmanship of these pieces and with good reason. In manufacture style they approach the best Mississippian knapping technique and far eclipse contemporary Anasazi work. All three of the Kiva Q knives were made on exotic materials: two on brown fossilferous chert and one on fine white quartzite. The brown fossiliferous chert was also seen in some of the arrow points from Burial 10 at Pueblo Bonito described earlier. Judd unsuccessfully attempted to pinpoint its source (Judd 1954:129-130) and concluded that it was not local and it might have come from El Paso, Utah. A fourth fragment of a similar knife was found by a

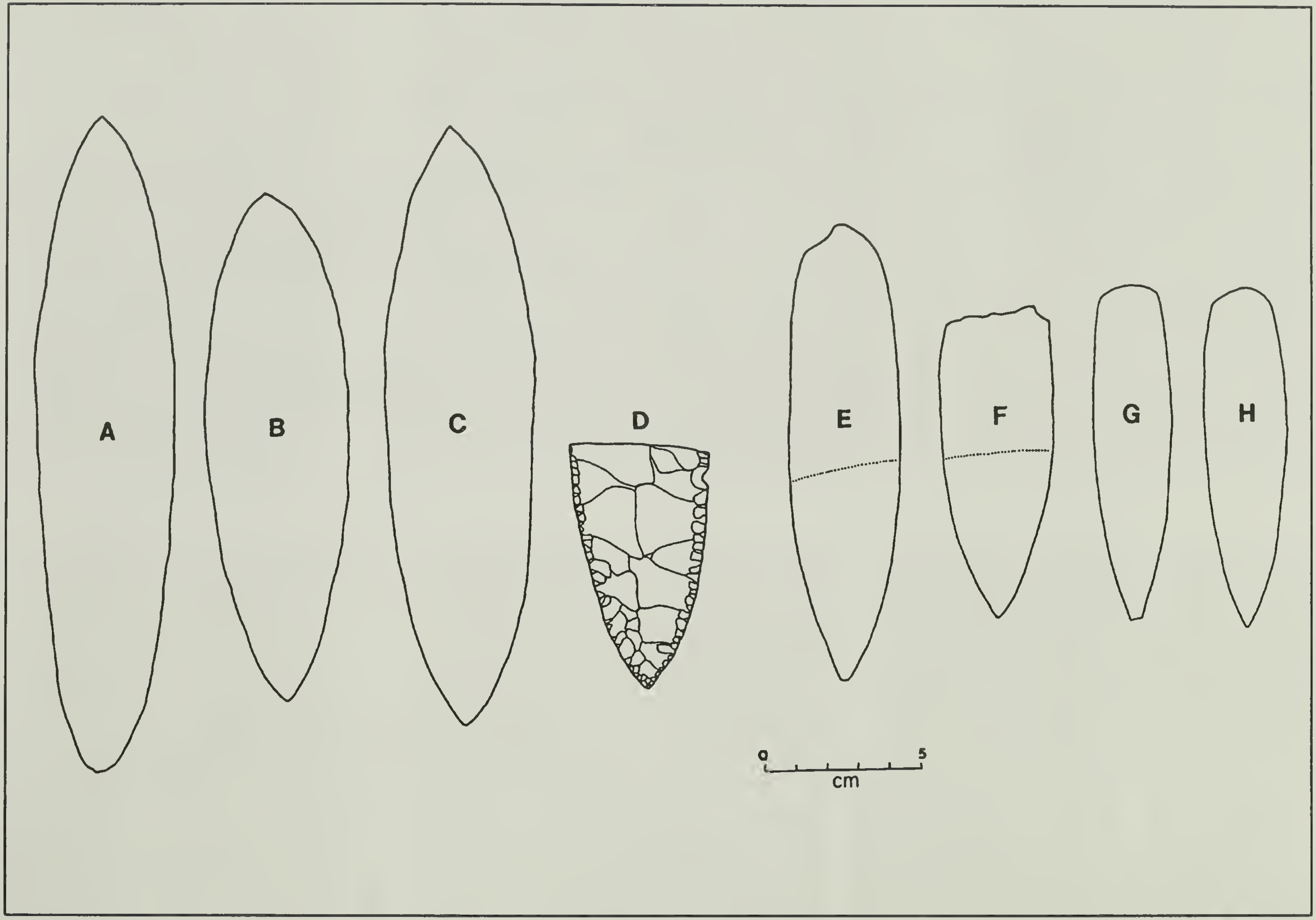


Figure 4.8. *"Knives" from Pueblo Bonito and Pueblo del Arroyo. A, B, C) Pueblo Bonito, sealed niche, Kiva Q. D) Pueblo Bonito, south wall of Room 316. E) Pueblo del Arroyo, Rooms 28 and 32 fill (Judd 1954). F) Pueblo del Arroyo, Rooms 28 and 32 fill (Judd 1959). G, H) Bc 51, niche in north wall of Room 45.*

stabilization crew in a sealed niche in the south wall of Room 316 at Pueblo Bonito. It is made of the same brown chert as the Kiva Q knives and, when complete, would have been almost identical to the smaller of those (Judd 1954:Plate 28j). Thus, there are four of these remarkable knives, all from caches sealed in walls at Pueblo Bonito.

A knife very similar to the examples from Pueblo Bonito was found in a Mesa Verde phase burial at the Aztec Ruin (Burial 106 from Room 183).

> "A red quartzite knife blade 7 5/8 inches (about 19 cm) long was on edge against the outer surface of the right humerus. Brown powder resulting from the decay of the wooden handle continued to the elbow" (Morris 1924:200, Figures 19 and 20).

I have not examined the piece itself, but in a print of the original in the illustrations in Morris (1924:Figure 19), it appears nearly identical to the Bonito knives in form and flaking.

Drills and Perforators

Drills (formal, facially flaked tools) and perforators (retouched flakes) made up only about 6 percent of the collection. Some tools assigned to other classes might also have been used as drills, but we assume that <u>all</u> of the tools here called drills were, in fact, just that. Edge damage of any kind could be observed on only 12 drills, but in eight of those cases that damage was rotary, and in the other four, damage was also consistent with drill use (tip crushing, damage latitudinal to the long axis of the bit).

In arrow points, the base is constrained by hafting requirements and thus shows little significant metric variation. Arrowpoint blades, on the other hand, are free to vary considerably in size; and they do. In drills, the reverse seems to be true (Table 4.9 and Figure 4.9). Although some drills were probably hafted, many and perhaps most of these tools were never hafted or mounted on shaft and, thus, the form and measurements of the base are quite variable (Figure 4.10). Some measures of bit size are much less variable (particularly width and thickness of the bit just above the base). Blade length, on the other hand, was extremely variable—perhaps the most variable of any drill measurement. Length would seem to be critical for drill function as it would determine the depth that could be penetrated and might tell us something about the kind of material being penetrated, since a long bit would snap under torsion in hard materials. It seems likely that longer bits were used in softer materials.

Table 4.9. Mean drill measurements (in mm).[a]

Mean	s.d.	N
13.66	9.75	59
16.90	8.93	63
13.39	6.69	70
7.93	3.67	76
4.48	1.84	71

[a] Width at base of bit defines the blade and base lengths along the long axis of the tool. Base width is the maximum width of the tool below the bit.

Base shapes (Figure 4.10) included: A) round, B) rectangular with the bit centered, and C) rectangular with the bit offset or tangent to one side, D) "T," E) contracting (tanged), and F) irregular (non- or unfinished). Analysis of variance showed bit length to be the only measurement that varied significantly with base shape (probability > 0.01). That is, while bit width and thickness are unimodal and not markedly variable, bit length not only varies but apparently varies in relation to base form. The difference appears to be between irregular and more formal base shapes: irregular (minimally finished) bases have bits with a modal length of about 9 mm, while formal base-shaped (round, rectangular, "T," etc.) have modal bit lengths of 20-to-24-mm. Thus, I suspect that drills with formally finished bases (with the possible exception of the contracting or tanged form) were perhaps used unhafted in softer materials.

Irregular bases and rectangular bases with the bit centered were found in contexts of all time periods (Table 4.10). Rounded base drills were found only in Basketmaker III and Pueblo I contexts; "T" and contracting (tanged) drills were found only in Pueblo III. Sample size is far too small to attach great importance to these distributions; they are offered here simply as observations.

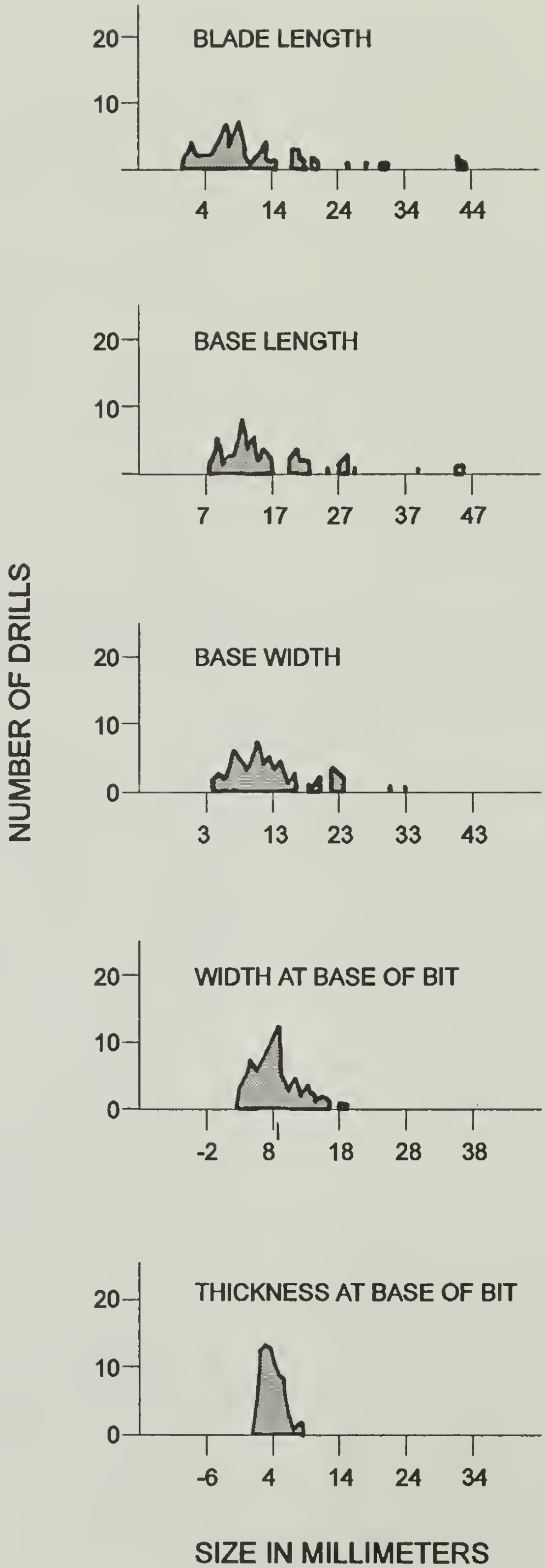


Figure 4.9. Mean drill measurements.

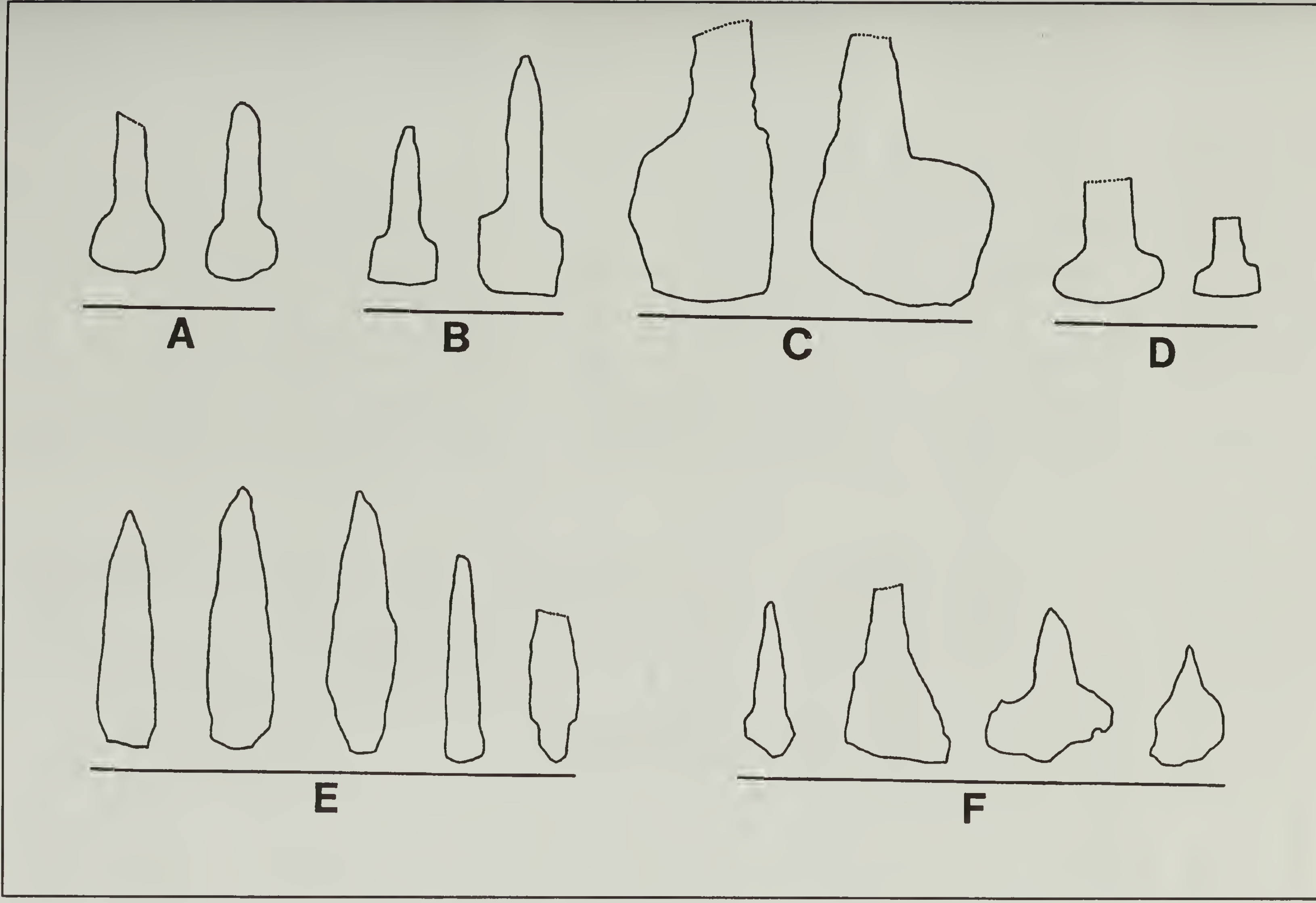


Figure 4.10. *Drills. A) Round base. B) Square base. C) Square base, offset. D) T-base. E) Straight or contracting base. F) Irregular. First row, left to right: 29SJ 1874, 29SJ 1116, 29SJ 249, 29SJ 1612, 29SJ 378, 29SJ 393, 29SJ 294, 29SJ 393. Second row, left to right: 29SJ 2060, 29SJ 352, 29SJ 1804; 29SJ 393, 29SJ 2090, 29SJ 249, 29SJ 324, 29SJ 1612, 29SJ 1879.*

Table 4.10. Drill base shapes through time.

	Round	Rect./ Offset	Rect./ Center	"T"	Irregular	Contr.	Perf.
Archaic	-	1	-	-	1	-	-
Basketmaker III-Pueblo I	4	-	3	-	3	-	3
Pueblo II	-	-	3	-	15	-	2
Pueblo III	-	2	2	1	4	2	1

Table 4.11. Drill material types.

Material		Percent
Morrison Formation materials		1.1
Yellow-brown spotted chert		-
Washington Pass chert		2.3
Zuni wood		1.1
Obsidian		3.5
High surface chert		2.3
Cherty wood		-
Splintery wood		-
Chalcedonic wood		-
Quartz		-
Other, which includes:		19.5
Miscellaneous fossiliferous chert	-	
San Juan fossiliferous chert	-	
High surface quartz sandstone	-	
San Juan shale	-	
Pedernal chert	-	
Laguna chert	-	
Miscellaneous cherts	5.7	
Miscellaneous chalcedony	13.8	
Vitrophyre	-	
Total No. of Drills		87

Over 90 percent of the drills and perforators were made on local materials; mostly on tough petrified wood (Table 4.11). This is in clear contrast to arrow points and knives. The few (seven) drills made on exotic materials all had formal, geometrically regular bases (mostly round).

There were several very small perforators (Figure 4.11) associated with turquoise bead manufacturing debris at several sites. These contexts have been discussed elsewhere (Cameron, this volume; Mathien, this volume). Other than this group, there are no specific observations or conclusions about Chacoan drills; they are much like drills throughout the Anasazi area.

Miscellaneous Artifacts

Points, knives, and drills made up almost 70 percent of the collection. Of the remaining tools, over one-half were "miscellaneous tool fragments" (point tips, small blade fragments, etc.), one-quarter were Archaic points and the final one-quarter were, quite simply, odds and ends (Figure 4.12). This included a few probable arrow points that exceeded the 10 mm minimum-stem-diameter-cutoff (e.g., Figure 4.12E and F), and some asymmetric, irregular, typologically unrecognizable points (mostly unfinished). These are described in the chipped stone sections of various site reports, but will not be considered further here.

A few odd forms are noteworthy: two asymmetric knives (one finely and the other roughly finished) were clearly hafted (Figure 4.12A). Because these blades were clearly designed for transverse rather than axial cutting, it would appear likely that the haft was not the simple handle form seen in extant specimens (referred to above). Two rounded tip "knives" (Figure 4.12B) were found at 29SJ 629, which is a Pueblo I-Pueblo III site. The form is unique in terms of Chaco Canyon. These do not appear to be hafted scrapers as their outlines might suggest, but are clearly rather specialized forms of unknown function. Very large corner-notched points/knives (Figure 4.12C) were notable for occurring only at two large sites; Pueblo Bonito and Una Vida. These may well represent curated or reused Archaic tools of a type unknown to the author, as might the large side-notched point shown in Figure 4.12D. It is noteworthy that the knife that Pepper found with haft intact at Pueblo Bonito (Pepper 1920:Figure 134) was nearly identical to this piece. Other items in Figure 4.12 have been discussed above, but the two eccentric obsidian pieces (Figure 4.12H) are illustrated primarily for the information of other researchers working in Basketmaker contexts (from which the two came).

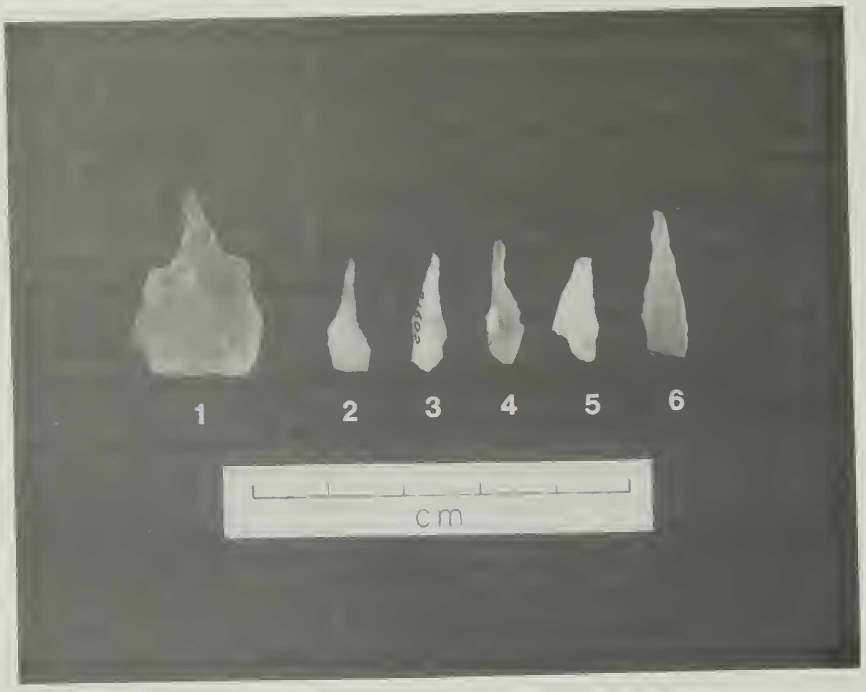
Chipped Stone Tools and the "Chaco Phenomenon"

What do chipped stone tools tell us about the inhabitants of Chaco Canyon? Like most of the other portable artifacts found at Chaco, they tell us that chipped stone tool production and form was, with a few exceptions, well within the Anasazi mainstream. Saving only the arrow points from Burial 10 and the large bifaces from Pueblo Bonito, there is little in the stone tool inventory that should raise the eyebrows of any Anasazi archeologist. The points, knives, and drills of Chaco Canyon are, in themselves, unremarkable examples of Anasazi lithic technology.

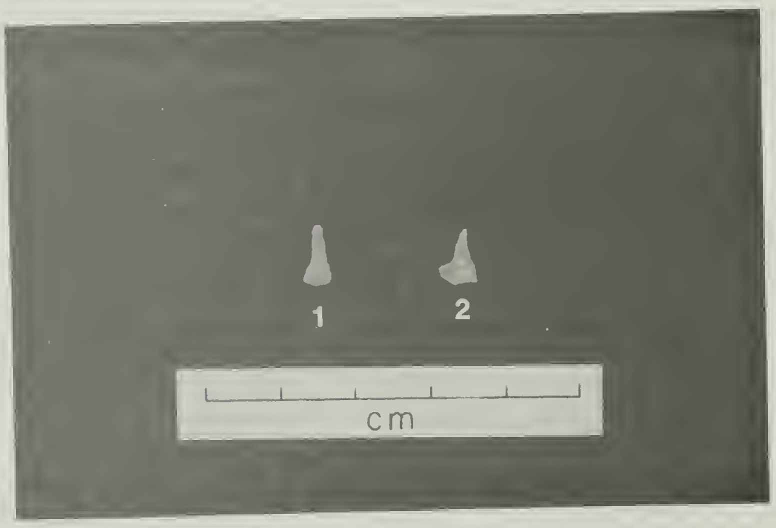
There is little of note in the form and production of the tools themselves, but there may be much of interest in their contexts in sites in Chaco Canyon. Aside from the obvious and rather inevitable conclusion that the few strange and peculiar things were found at Pueblo Bonito, there are some interesting differences in the numbers and deposition of tools at the large Chaco buildings when compared to the rest of the Anasazi world and to other Chaco sites. To begin with, there is the question of numbers.

Pueblo Bonito produced over a thousand arrow points and probably many, many more not mentioned in the published accounts of the site. It is important to note that none of this material was screened. The true number of points at Pueblo Bonito almost certainly exceeded 1,500. Is this an extraordinary number of arrow points for a 700-room structure? Cameron (this volume) has noted the high numbers of points at major Chacoan sites relative to the smaller sites in the canyon, but how many points are exceptional in larger sites?

It is difficult to assess this question. We can look at totals from large sites comparably excavated, but there are remarkably few of those with published data and almost all of those are "Chacoan." I will discuss these later, but for contemporary ruins, I had to range all the way to the Mimbres area. Swartz Ruin, a Mimbres site contemporary with Pueblo



A



B

Figure 4.11. *Micro-drills. Upper: 29SJ 626 (NPS Chaco Archive Negative No.32077). Lower: 29SJ 629 (NPS Chaco Archive Negative No. 31423). Full size.*

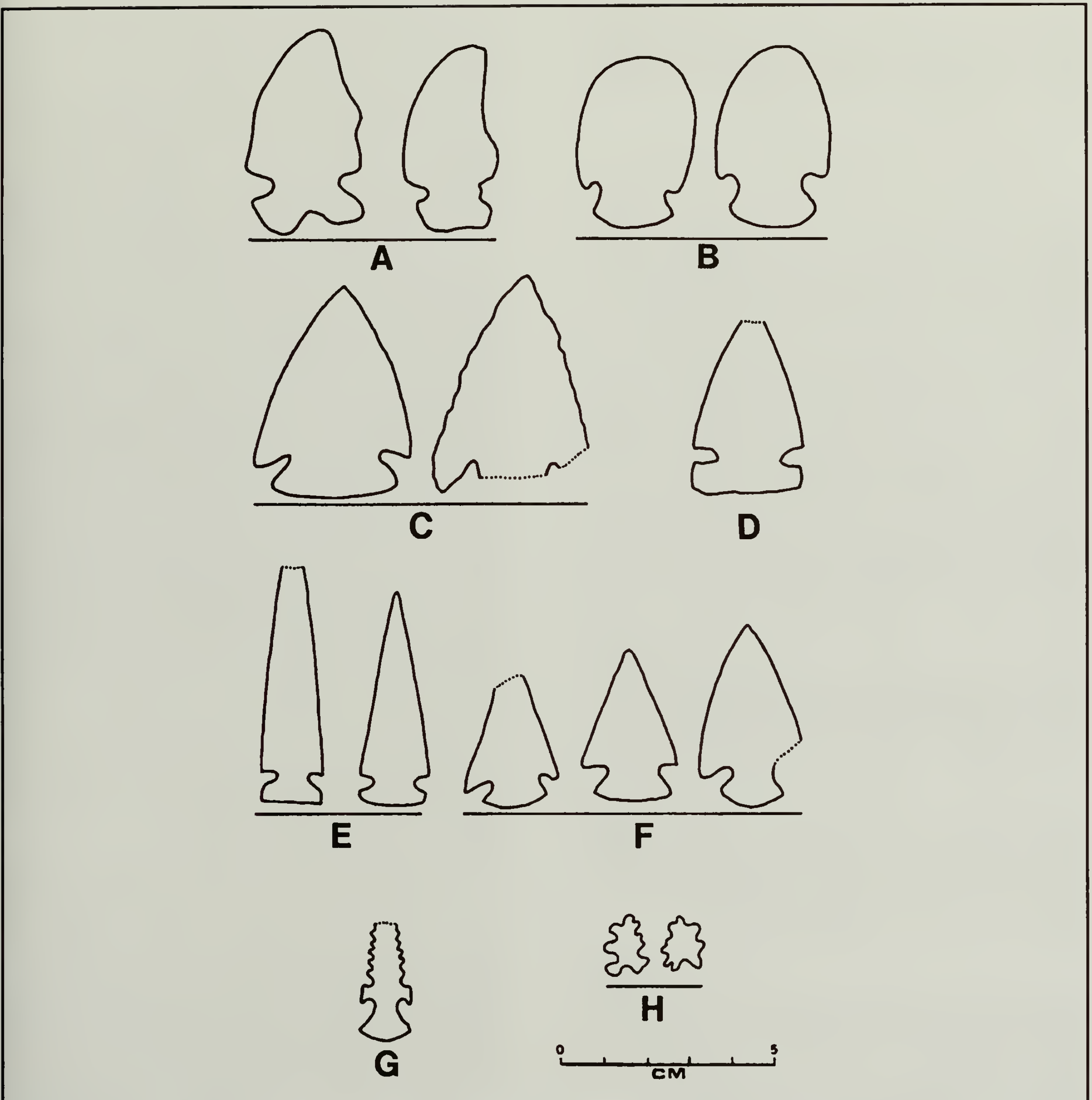


Figure 4.12. *Odds and ends. A) Asymmetric hafted knives (?); B) Rounded tip knives (?)—these do not appear to be hafted scrapers; C) Larger corner-notched points/knives; D) Large side-notched point/knife—this does not appear to be a reused Chiricahua point; E) Large side-notched points, probably arrow points; F) Large corner-notched points, probably arrow points; G) Neff point (see text); H) Obsidian eccentrics, both from BMIII contexts. Top row, left to right: 29SJ 1360, FS 365; Bc 51; 29SJ 627, FS 5822; 29SJ 627, FS 804. Second row, left to right: Pueblo Bonito, Kiva Q, niche; Una Vida, Room 63, floor; 29SJ 633, FS 1062. Third row, left to right: Pueblo del Arroyo, Room 139, fill; no provenience (C1983); 29SJ 383; Una Vida, Room 83, fill; 29SJ 627, FS 4690. Fourth row, left to right: Pueblo Bonito, Room 251; Shabik'eshchee, FS 148; 29SJ 299, FS 365.*

Bonito, but only about one-sixth its size, produced about 130 points (Cosgrove and Cosgrove 1932:47-48). Proportionately, Swartz Ruin produced about half as many points as Pueblo Bonito.

Later sites and particularly Pueblo III-Pueblo V Rio Grande pueblos seem to have produced as many or more points than Pueblo Bonito. For example, Mound 7 at Gran Quivira, a Pueblo III-Pueblo V ruin about one-fourth the size of Pueblo Bonito, but occupied for approximately the same length of time, produced about 290 arrow points (Hayes et al. 1981:108). If we accept this rough estimate of relative size, this suggests a density of arrow points at Mound 7 of comparable magnitude to that at Pueblo Bonito. Pecos Pueblo, as in so many other things, is exceptional in the number of points recovered. Kidder (1932) estimated that he dug 12 to 15 percent of this enormous site. He dug about this fraction of the 1000+ room north quadrangle (perhaps one-fifth larger than Pueblo Bonito), but rather more of the extensive trash deposits to its east (Kidder 1958). He also excavated large areas of earlier ruins around and beneath the north quadrangle. Almost 1,000 arrow points were recovered (Kidder 1932:15). This is a staggering figure suggesting over 6,000 points from the entire site (if Kidder's estimate of 15 percent is meaningful and correct). There are several centuries of occupation at Pecos; but Pueblo Bonito was also occupied for at least 300 years. The quantities of arrow points at Pueblo Bonito are not particularly impressive when compared to Pueblo III-Pueblo V pueblos on the Rio Grande and (almost) pale in significance when compared to Pecos.

Pueblo Bonito has more points than the contemporary Swartz Ruin, but less than later Rio Grande pueblos. What economic or technological differences affect the numbers of points found in big ruins? I suggest that the functions of Chacoan greathouses and Pueblo IV-Pueblo V pueblos were quite different; an idea also supported by the number of burials at each. The paucity of burials at Pueblo Bonito is notorious; at Pecos, Kidder recovered almost 2,000 burials in 15 percent of the site! Five hundred and ten burials were recovered from Mound 7 at Gran Quivira (Reed 1981). Setting adequate scales for the evaluation of quantities and densities of arrow points will take a great deal more comparative work. We must content ourselves here with the close horizon of the Chacoan system. Within the Chacoan "context," the number of points at Pueblo Bonito is extraordinary and deserves further thought.

Salmon Ruins, for example, produced almost 590 points, but only 7 percent of these could be assigned to Chacoan contexts. The remainder were either associated with the Mesa Verde component, or could not be dated (Moore 1981). Not all of this site was excavated, but extrapolating from the excavated portion (keeping in mind the careful data recovery that marked the Salmon Ruins project), it seems clear that Pueblo Bonito produced many more points than did Chacoan contexts at Salmon. A similar situation exists at Aztec Ruin. Morris recovered at least 330 points there, but from the context of points mentioned in his notes (Morris 1928) and his discussion of their form (Morris 1919:34), it seems likely that almost all of these were from Mesa Verde contexts. (The cache of 200 points mentioned in the Aztec report [Morris 1919:34] were not actually from that site; they were found at an unknown site between Aztec and Salmon in a Mesa Verde Black-on-white jar.) From the discussions in the published accounts, it appears that Salmon and Aztec each produced around 50 points from Chacoan contexts—far fewer points (either absolutely or proportionately) than did Pueblo Bonito.

This holds true for at least one other major site in Chaco Canyon as well. Kin Kletso, a 120-room ruin that was completely excavated, produced only 67 points (Vivian and Mathews 1965).

Kin Kletso, Salmon, and Aztec were all built late in the Chacoan sequence. It is possible that short time depth and, perhaps, functional change in Chacoan buildings (Lekson 1984) are reflected in the low numbers of points at these three sites. Some information exists from two other major sites that were contemporary with all but the earliest construction at Pueblo Bonito; these are Chetro Ketl and Pueblo Alto. Although it is impossible to precisely quantify, the number of points at Chetro Ketl seems to have been very low, probably on the same level as the Chacoan contexts at Salmon and Aztec. From the extant notes (Lekson 1984), I estimate that considerably less than 100 points were recovered at Chetro Ketl.

Pueblo Alto, on the other hand, may approach Pueblo Bonito in numbers of arrow points. Work at Pueblo Alto produced 54 points and about 70 point fragments. It is dangerous to extrapolate from the

small part of the site that was excavated, but we might, perhaps, expect to find about ten times this many points if all of Pueblo Alto was excavated (cf. Cameron, this volume; and Toll, this volume). This is still far fewer than Pueblo Bonito, but when gauged by number of rooms or floor area, the projected number of points at Pueblo Alto is impressive. It may approach the quantity and density of arrow points found at Pueblo Bonito.

At Salmon, Aztec, Kin Kletso, and Chetro Ketl, points apparently were found throughout the excavations, in trash, in wall-fall, in roof-fall, in room fill, and elsewhere. These finds form a kind of "background noise" of arrow points also evident at Pueblo Alto and Pueblo Bonito. What differs at the latter two sites (particularly the last) were extremely dense clusters of points in a few very small proveniences. At Pueblo Alto, almost half of the arrow points were found in a few levels of a test trench in the trash fill of one unit, Kiva 10. Pueblo Bonito is a much more striking illustration of dense deposits of arrow points: in Room 39, "211 perfect arrowpoints and 112 fragments;" in Room 48, "102 perfect arrowpoints and 52 broken ones;" in Room 10, "...among the 180 arrowpoints found in the deposit, there is hardly one that is not misshapen or broken. The majority show clean breaks as though the points had been snapped between the fingers" (Pepper 1920:56, 196, 207). Room 32 produced at least 81 points still mounted on the arrow in a bundle that Pepper interpreted as a quiver (Pepper 1920:159-160). (Judd apparently did not find similar concentrations of points at Pueblo Bonito.)

The context of these finds is clearly unusual. Pepper commented on "sacrificial breaking" of both points and many other unusual artifacts in Room 10 and the "quiver" in Room 32 was one of the few relatively mundane objects in this crowded room. In both cases, large numbers of points were part of deposits containing quantities of unusual ground stone, wood and other artifacts that appeared to be intentionally broken (Room 10), or simply abandoned en masse (Room 32). The point concentrations at Pueblo Bonito are strangely intriguing: why discard so many "perfect" points in such dense depositional events? I suspect that this is not normal discard, or chance loss, or anything that approaches day-to-day Anasazi economic routine. High levels of artifact "consumption" have been noted (at Pueblo Alto) for both lithics and ceramics. The remarkable numbers of arrow points at Pueblo Bonito are yet another symptom of this same condition, but we have yet to diagnose the condition itself.

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Appendix 4A

General Observations of Flaked Stone Technology

Bruce A. Bradley

In the mid 1970s, I had the opportunity to examine a large collection of flaked stone artifacts recovered during various projects in Chaco Canyon. Although I was unable to undertake an extensive, detailed analysis, I examined enough material to make general statements about Pueblo II and III flaked stone technology.

Primary Technology

Generally speaking, the production of flakes was highly opportunistic with little to no core platform or surface preparation. With the available raw materials, this approach resulted in cores with multiple platforms and flaking surfaces. Two basic core forms resulted—globular and discoidal. Many, if not most, of the globular cores were used as pecking stones and it is even likely that some were the intended product rather than a byproduct of flake production. Discoidal cores were also sometimes recycled into pecking stones. It is not clear whether the discoidal form was the result of a standardized approach to flake production or whether it was from the use of flat or tabular pieces of raw material. I observed one small core with a single platform and small parallel blade scars. Alone, this could easily have been unintentional, but the occurrence of this form (along with small blades in the Montezuma Valley of southwest Colorado) may indicate that there was a minor bladelet production technology, possibly for the production of small drills.

Secondary Technology

Although bifacial tools are a relatively minor component of the flaked stone assemblage, they are present. These occur in two basic tool types: bifaces (probably mostly used as knives), and projectile points. A wide range of flaking styles is present from minimal shaping to highly controlled bifacial thinning (see Judd 1954:Plate 90f). Bifacial percussion is seen on items of all sizes from large bifaces through small projectile points. It was the main technique used to produce Archaic projectile points and was not uncommon on Pueblo II and III arrow points. Pressure flaking was also common on the whole range of bifacial implements, but was mainly used to straighten and sharpen edges rather than as a thinning technique.

A great range of craftsmanship is represented in the assemblages, from simple edge-trimmed flakes, used to produce some small arrowheads and drills, to total facial thinning, resulting in artifacts with regular flake scar patterns and outlines. Notching of small arrowheads was done with pressure flaking and tended to be relatively narrow and deep. Some of the notches even expand as they get deeper. Many arrowpoints have narrow tapered tips ("needle points") that would have improved their ability to penetrate and also occasionally serve as drills.

Other perforators and drills were made on small flakes and fragments with steep bifacial pressure flaking, producing more-or-less regular diamond-shaped cross-sections. Some very small drills were made from angular fragments that were used with almost no preparation other than light grinding of edges.

The majority of the bifacially flaked artifacts were produced from fine-grained, homogeneous stones. Although well-represented in the collections, obsidian artifacts exhibited less well-controlled flaking than did their counterparts made of more resistant materials. This may have been the result of knappers who were accustomed to using "tough" materials, only occasionally having access to obsidian.

Other Observations

The presence of percussion flaking on relatively small bifacial artifacts indicates that a certain amount of caution should be exercised if and when use-wear analysis is undertaken. The difficulty of holding such objects while flaking with percussion results in a substantial amount of edge crushing in the form of small step fractures. This effect may have been reduced by light grinding of the edge before flake removal. Both the step fracturing and the intentional edge grinding could be mistaken for use damage.

An unusually high percentage (20 percent) of the obsidian bifacial artifacts exhibit surface abrasion and/or grinding, and many also have crushed and battered edges. Although some of this could have been the result of normal knife use, the extent and locations of the damage are more consistent with damage caused by contact with hard and abrasive objects. It is possible that obsidian artifacts, especially those picked up from earlier sites, were considered special and used as components of medicine bundles and/or in rituals (a common practice in historic pueblos).

Chapter Five

The Abraders of Chaco Canyon: An Analysis of Their Form and Function

Nancy J. Akins

Introduction

> Abraders were to the Bonitians what planes, rasps, and carborundum wheels are to the twentieth century farmers. They were the tools with which other tools were made, the chief reliance of the woodworker. Abrasive stones were never standardized; we find them in all manner of shapes and sizes. Some are merely casual fragments, used once and tossed aside. Others are so carefully made, so trim and neatly squared as obviously to have been designed for special purposes. (Judd 1954:118).

The Chaco Project began the analysis of ground stone in the fall of 1975. This was a high priority analysis category because the artifacts took up a great deal of storage space and once the analysis was completed the stone could be moved into dead storage. Four groupings of ground stone were used, each with their own analysis. These included manos, metates, abraders and anvils, and other-shaped stone.

A variety of stone tools were used for grinding. If manos and metates are removed from consideration, the abraders remain. For this analysis these include active abraders, passive abraders, grooved abraders, polishing stones, and anvils. Anvils are considered with the abraders because they usually were involved in some grinding, and anvil wear frequently occurred on the other kinds of abraders. The terminology and concepts of active, passive and grooved abraders were borrowed from Neil Judd (1954).

Abraders, recognized as a distinct type of artifact, have generated much speculation on their use. It was hoped that the sample size would be large enough to isolate different kinds of abraders and that by looking at contexts, we might learn which were used consistently over time and monitor changes in use.

The first step in the analysis was to devise a recording format and to analyze a random sample of artifacts identified as abraders. This process gave the analyst a basic familiarity with the group of artifacts and resulted in a massive reformatting of a number of variables before the final analysis was begun. Once the analysis format was revised, each artifact was analyzed. Subsequent years of excavation brought more ground stone, which was analyzed after each season of field work, adding results to the permanent file. Final reports were prepared five years after the initial random sample work was done.

There are disadvantages to the procedure followed. The sites, and thus the analysis, were done in chronological sequence, beginning with the Basketmaker sites and working up through Pueblo III. This resulted in the addition of new artifact types along the way. With the abraders, artifacts that occurred in early sites infrequently enough to be lumped into an undifferentiated category were often common in later sites and merit their own type for analysis. This resulted in an inequity of typological

assignment. Also, when analysis is done at yearly intervals, it is difficult to be consistent when recording variables that require subjective judgments. The time lapse and storage conditions made retrieval of a single artifact extremely difficult.

The analyst had a basic familiarity with ground stone, which was acquired through two years of carefully describing and drawing objects from excavations in Chaco Canyon. This background, plus a literature search for basic terminology and prospective types, provided the basis for the initial random sample.

The Random Sample

A more detailed report on the results of the initial analysis (Akins 1976) is on file in the National Park Service Chaco Archive; only the highlights are given here.

All artifacts recovered from the 1973 to 1975 excavations in Chaco Canyon were inventoried in a very gross manner, providing us an estimate of the population to be sampled. Table 5.1 lists the number of artifacts from each site.

The individual artifacts to be analyzed were chosen using a random number table which ranked the Field Specimen (FS) numbers; in the event of a misidentification, the next number was chosen. Alternatively, for polishing stones from all sites and active abraders from 29SJ 627, a list of the FS numbers was taken from the computer in the sequence in which they were stored. Assuming that the FS number assignment was somewhat random and the storage sequence was also somewhat random, this sample was further randomized by our inability to locate some of those artifacts which were to be analyzed.

Appendix 5A includes the initial abrader format used in the random sample. Most of the variables will be discussed in the section concerned with the final format.

As a result of the random sample analysis, it was concluded that the sample was not large enough to encompass the variation within each group or even to allow for the clustering of attributes and the definition of types. It did allow several variables to be dropped from the analysis, others to be condensed, and it pointed out the difficulty of distinguishing specific abrader types within general categories. A number of types were defined and these were identified through a variable. An attempt was made to substantiate these types in the final analysis.

The Final Analysis Format

A total of 39 variables, designed for computer manipulation, were recorded for each artifact. The format for these can be found in Appendix 5B. Each variable will be described below.

1-8) Provenience information includes the site number, major provenience type and number (Room 4 = 04004), the location in the major provenience unit where it was found by layer or level, and the general (Test Trench 3) or specific provenience (Posthole 5).

9) The condition of the artifact was recorded as "complete" if complete, "broken" if it was missing either length, width or thickness, and "fragmentary" if only one measurement was possible. If no measurements were possible, the artifact was dropped from the study.

10-13) Dimensional variables. Measurements were taken only if that dimension was complete. In other words, if the length was incomplete, the width and thickness would still be recorded. Incomplete measurements were recorded as a series of nines. This was advantageous in the situation where there were few representatives of a type and thus maximum use could be made of the complete dimensions. In general, the length was the largest of the two dimensions, but there were exceptions. With active abraders the striations parallel the length axis; if the striations paralleled the shorter side, it was defined as the length. Maximum measurements were taken on irregularly shaped objects. Complete artifacts were weighed to the nearest gram, and measurements were to the nearest centimeter.

14) Burning was recorded as "none," "partial," or "complete."

15) Material identified the material from which the artifact was manufactured. The method devised for the classification of sandstones was developed when the inventory was first initiated. The Mohs Hardness Scale was too gross for our purposes so a

Table 5.1. The random sample.

Type	Site Number 29SJ 299	29SJ 724	29SJ 628	29SJ 627	29SJ 629	Total
Active abrader	3	0	2	18	1	24
Passive abrader	3	2	2	3	-	10
Grooved abrader	1	-	8	2	-	11
Polishing stone	14	3	6	13	1	37
Anvil	2	1	3	11	1	18
Palette	0	0	3	2	0	5
Total	23	6	24	49	3	105

copper penny (preferably 1972 Denver mint) was used. "Soft sandstone" was that which could be easily crumbled with the hand, "medium sandstone" was not as crumbly but still could be scratched with the fingernail. "Hard sandstone," when scratched by the penny, would leave some copper behind but also would remove a small amount of the rock. "Very hard sandstone" would leave only a copper streak without damage to the rock surface. This was performed on the use surface since this often varied in hardness from the opposite face. Other material identifications were made by A. H. Warren, a geologist then associated with the Chaco Project. See Appendix 5C for a listing of these types.

16) The color of the material was determined using a Munsell Rock Color Chart. This was used only once in the analysis. There are so many alternatives that large groupings of colors were used to reduce the number of choices to a manageable size.

17) Grain size was conditioned by the fact that almost all of the sandstone used for these artifacts was locally derived from the Cliff House Formation and is fine to very fine-grained (1/16-to-1/4 mm) as measured by the Mounted Sand Grain Folders manufactured by the Geological Specialty Company. The distinction between these sizes was so minute that the artifact was generally checked to see if it was at least fine-grained; and a distinction between fine and very fine was not made. For materials other than sandstone, a nine was recorded.

18) The plan view or shape of the object was reduced from the random sample where many alternatives were available. It was unduly complex and reduced to "rectilinear" for squarish or rectangular artifacts, "circular" for round or oblong artifacts, and "other" for all other shapes. "Unknown" was recorded for incomplete artifacts.

19) The previous form refers to what the object was before its use as an abrader, either a naturally occurring object such as a concretion or river cobble or another kind of artifact. Only the most common of these were recorded: manos, metates, abraders, slab covers, and anvils. "Other" was used for any other class, and a nine if it was unknown or indeterminate.

20) Artifact type was the subjective type assignment for the artifacts. These are described in a later section.

21) Manufacture refers to alteration that was for the abrader function. It did not include alteration for a previous form or a secondary use. Variables included "flaking," "abrading," and "pecking," or any combination of these three.

22) The subjective assessment of the amount of work put into the artifact was "slight" when there was a minimal amount of alteration, "moderate" when most of the artifact was shaped, and "extensive" when it was entirely modified from the original rock form.

23) The degree of primary wear is a subjective assessment of how much the artifact was used. The material was taken into consideration since an artifact made of hard material would show wear differently than a soft sandstone artifact. "Light" was recorded if the wear was not complete for a surface or there were still high or low spots that indicated the surface

had little use. "Medium" was for those that did not exhibit characteristics of light or heavy use. "Heavy" use was utilized when an artifact was used extensively, such as a concave surface in a passive abrader or actual facets on a polishing stone. "Mixed" was recorded when there was more than one surface and the wear varied from face to face.

24) The size of the primary use surface was measured with a mylar overlay gridded in centimeter squares. The number of squares covering the use surface was counted for complete use surfaces. In the event of multiple surfaces, the most used was measured.

25) Surface contour was designed for multifaced tools with a variety of contours. The number of faces with each contour was recorded. This was inadequate for only two grooved abraders that were covered with many small grooves. Options included "irregular," which was often found in little used tools where the wear had not worn the surface smooth, "flat" for surfaces that were entirely flat or had a slight taper at the edges, "slightly concave" was less than a one-centimeter-dip in the transverse surface, and "concave" was a dip of more than one centimeter. "Slightly convex" was generally less than one centimeter and "convex" more than one centimeter. The size of the artifact was also taken into consideration. A one-centimeter-difference can be a lot in a small artifact.

26) The location of the use surfaces located the other use surfaces in relation to the primary use surface (Figure 5.1).

27-33) These variables analyze the other wear on the primary use surfaces. The following kinds of wear were recorded as "absent," "light," "medium," "heavy," "characteristic of the primary use," "characteristic of a previous use," or "characteristic of the secondary use." The assessment here is again subjective and follows the guidelines in variable 23. This wear included "edge-rounding," "cutting or gouging," "grinding or polish," "striations," "pecks," "staining," and "other."

Edge-rounding is the rounding of the edges of an artifact. This is generally highly polished and probably results from several actions. Working of soft or pliable materials, such as leather, could produce rounding as could simple hand or floor wear. Stones used as entry way slabs often exhibit rounding from many feet passing over them.

Cutting and gouging occurs when the artifact is used as a work surface. This results in elongated scars and scratches on the rock face. Grinding and polish are characteristic of most kinds of abraders, anvils being the exception. When actual polish was present, "heavy" was recorded rather than "characteristic."

Striations result from grinding materials harder than the rock itself. These are generally minute and take a high-intensity lamp and much twisting and turning to observe. They indicate which direction the artifact was used and an idea of how hard the material ground was.

Pecks are similar to gouging in that the artifact was used as a work surface, but here something is struck against the surface, resulting in a small circular pit in the use surface. This is difficult to distinguish from manufacture or secondary use. Its positioning and other characteristics of the artifact must also be considered.

Staining was recorded when pigment was found on the use surface. Unfortunately, some pigment was probably washed off before the artifacts got to the analyst. The other category includes wear, such as drill holes, or any other wear not mentioned above.

34) The secondary artifact type or what the artifact was used for after its use as an abrader was identified when possible. A list of the options can be found in Appendix 5.C.

35) The amount of secondary wear was recorded as "light," "medium," or "heavy," using the guidelines in Variable 23.

36) The location of the secondary wear was recorded in relation to the primary use surface. The options are similar to those in Variable 26, with the addition of "corner," "whole artifact," "ends and edges," and "other." The same plane options have been lumped into one.

37) The field specimen or FS number is assigned to an artifact in the field and is used for identification. Variable 38 was a relic of an old system in which objects were given an A,B,C, etc.,

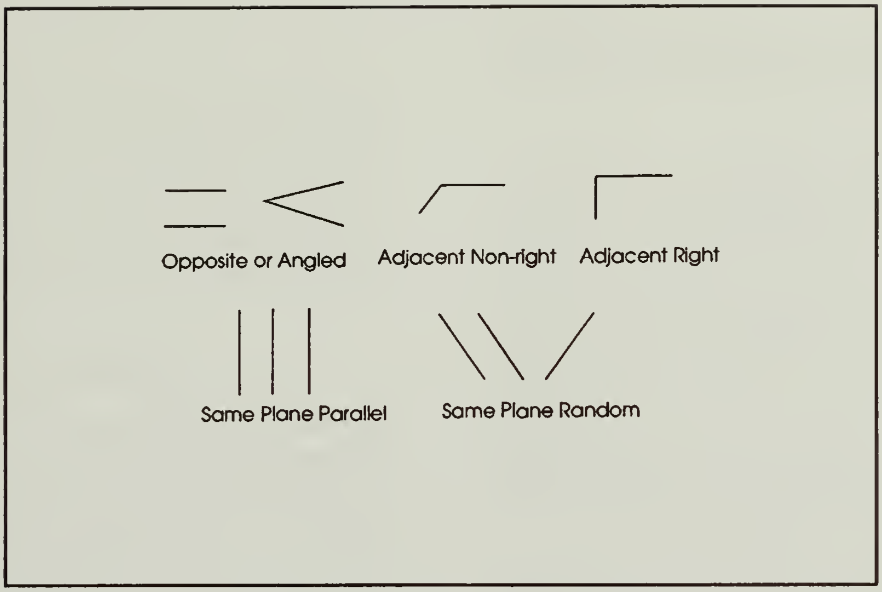


Figure 5.1. *Use surface locations.*

designation. This was carried on but not used. Variable 39, the specimen number was used when an FS number contained more than one abrader. Abraders were given sequential specimen numbers for further identification.

The Analysis

A total of 2,216 abraders were analyzed. One did not make it into the computer for unknown reasons. The information used for the type descriptions is based on the 2,215 card file. Several coding errors were corrected before the tables were completed. All type and site information was manipulated using the University of New Mexico IBM 360 computer and SPSS packaged programs (Nie et al. 1970). Breakdowns, frequencies, and crosstabs were used extensively.

Active Abraders

There are numerous references to artifacts resembling active abraders in the literature. For Chaco Canyon, Neil Judd (1954:119) describes these as "those held in the hand and used in the manner of a file." Vivian and Mathews (1965:93) refer to abraders as "small tabular abraders of various degrees of fineness," but do not separate active and passive abraders. They point out that abraders were also reported from Bc 50, Bc 51, Łeyit Kin, and Pueblo Bonito and are not rare items in Chaco Canyon. In the Mesa Verde area, active abraders are reported as hand abraders by Hayes (1975), unspecialized milling stones by Swannack (1969), and abraders by Rohn (1971).

Woodbury (1954) devised a classification system for the ground stone from the Awatovi Expedition. He describes "flat abraders" as whetstones, rasping stones, and scouring stones, some with slightly concave surfaces but mostly flat. He further subdivides these into "tabular flat abraders" of any shaped outline, but presumably rubbed against objects that were to be shaped or abraded, and made of fine-grained to poorly cemented sandstone. "Bar-shaped flat abraders" were elongated pieces of sandstone with a round, oval, or subrectangular cross-section, many with a series of facets merging into a round surface and of fine-grained sandstone. "Irregular flat abraders" resulted when the whole artifact was shaped from random wear on various surfaces with no evidence of intentional shaping. These were also fine-grained sandstones. Woodbury's classifications are largely descriptive rather than functional. Table 5.2 compares dimensional variables for all of the active abraders. The following groupings are more functionally oriented.

Table 5.2. Active abraders.

	Type									
Measure	10S	10H	11	12	13	14	15	16	17	19
Number	195	572	40	25	62	16	13	24	2	65
Number complete	161	466	36	15	30	16	12	11	2	57
Percent complete	83	81.5	90	60	47.6	100	92.3	45.8	100	87.7
Mean weight	237.5	390.9	370.9	309.3	790.1	256.4	411.5	142.0	105.2	886.1
Mean length	8.7	10.3	11.0	8.6	15.2	8.8	12.3	7.6	13.5	13.4
Mean width	6.7	8.0	8.0	5.4	9.0	6.8	8.2	6.1	7.0	9.9
Mean thickness	2.5	2.6	2.3	1.8	2.9	2.8	2.8	1.6	6.0	3.5
Surface size	37.8	51.9	57.1	42.4	101.2	36.2	66.7	10.2	53.5	83.4

10S = Soft active abraders.
10H = Hard active abraders.
11 = Faceted.
12 = Active lapidary.
13 = Manolike.
14 = Stone abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
19 = Abrader-anvils.

Type 10: Active Abraders

It was noticed quite early that two kinds of nonspecific active abraders existed, those of softer sandstone and those of hard sandstone and other hard materials. Because these could not have served the same functions, they are separated in the analysis by material type. Table 5.3 gives their numbers within each site and how much each site contributes to the type description.

Type 10: Soft Active Abraders

One hundred and ninety-four soft sandstone abraders were found; one from 29SJ 629 was not included in this analysis due to a coding error. In general, they are small, about hand-sized, but ranged up to 1579 g in weight (Table 5.4).

Dimensional Variables. Dimensional variables are presented in Table 5.5. As the table illustrates, these abraders have a fairly restricted size range. They tend to be from 5-14-cm-long by 3-10-cm-wide and 1-3-cm-thick.

Materials and Technology. Of these, 149 (76.8 percent), were very soft sandstone and 45 (23.2 percent) were medium sandstone. Only two were medium-grained sandstones; the rest were fine or very fine-grained sandstones.

One hundred of these (51.5 percent) are "other-shaped," 55 (28.6 percent) are "rectilinear," 25 (12.9 percent) were "circular," and 14 are unknown. Most, 171 (88 percent), had no previous form, two were made from concretions, nine could have been used as manos or manolike abraders, and one was a slab cover. Evidence of manufacturing was not common due to the soft nature of the material (Table 5.6).

Characteristics of the Use Surface. Soft active abraders were not used extensively; 95 (49 percent) were used lightly, 97 (50 percent) moderately, and only two (1 percent) heavily. The soft sandstone would not hold up under heavy use.

The area of the primary use surface had a large range but clusters between 20-60 cm. Table 5.7 gives the distribution of surface sizes for those which could be measured.

These 194 abraders had 349 recorded use surfaces, an average of 1.8 per abrader. Table 5.7 gives the number of use surfaces for each.

Not all of the recorded use surfaces are active abrader surfaces. Active abrader is the primary use, but abraders are such multipurpose tools that other kinds of use are often found. The best example here is a concave surface that indicates grooved-abrader use on an active abrader (Table 5.8). Otherwise, the percentages are not that different for a single use surface versus all use surfaces. The surface contours probably suggest a progression in the amount of use. The irregular contour represents a slightly used abrader followed by convex, slightly convex, flat then slightly concave, and concave contours.

The location of the other surfaces in relation to the primary use surface is difficult to describe. Table 5.8 attempts to do this. Each line in Table 5.8 represents an abrader configuration. For example, the second line states that there were three instances where another use surface was found at a right angle to the primary use surface. Table 5.8 indicates that other use surfaces are most often found on the opposite face with other surfaces on adjacent right angled faces and a few on an adjacent non-right angle face. The kinds of use found on the primary use surfaces are recorded in Table 5.9, as is the number of abraders with secondary use.

Only 13 percent of the soft active abraders were assigned a secondary use. The unknown category suggests that secondary use was possible but the use could not be definitely ascertained, whereas those recorded as having no secondary use were not used secondarily. Of those abraders with secondary use, 16 were recorded as light and 12 as moderate. The use was most often on a right-angled face, 19 times, once on a corner, five times on the same plane, and three times on ends and edges.

Comments. In his report on Mug House, Rohn (1971) recognized hard and soft abraders, both of which were found in small numbers, 32 soft and nine hard. Of the soft, eight were found in sites in a kiva which he thought suggested use by men. He also noted that there were relatively few abrading tools for the amount of abrading done on the stone walls. Hayes (1975) describes "hand abraders" as having one to four faces and being made of friable sand-

Table 5.3. Site distribution of active abraders.

Site Number	Soft No.	Soft %	Hard No.	Hard %
29SJ 299	6	3.1	16	2.8
29SJ 389	58	29.7	271	47.3
29SJ 390	-	-	1	0.2
29SJ 391	3	1.5	36	6.3
29SJ 423	3	1.5	3	0.5
29SJ 627	60	30.8	118	20.6
29SJ 628	7	3.6	28	4.9
29SJ 629	19	9.7	21	3.7
29SJ 633	24	12.3	58	10.1
29SJ 724	2	1.0	2	0.3
29SJ 1360	13	6.7	15	2.6
29SJ 1659	-	-	4	0.7
Totals	195	99.9	573	100.0

Note: Figures in tables could not be verified; errors may exist.

Table 5.4. Weights of soft active abraders.[a]

Weight (g)	No.	%	Summary Statistics	
1-49	15	7.8		
50-99	19	9.8		
100-149	28	14.5		
150-199	33	17.1		
200-249	19	9.8		
250-299	7	3.6		
300-349	7	3.6		
350-399	7	3.6		
400-449	7	3.6		
450-500	4	2.1		
500+	15	7.8		
Unknown	32	16.6	$\bar{x}$	237.47 g
			sd	212.84 g
Totals	193	99.9	range	20-1,579 g

[a] Weight of one soft active abrader not included in this table; reason unknown.
Note: Figures in tables could not be verified; errors may exist.

Table 5.5. Dimensions of soft active abraders.

Dimensions (cm)	No.	%	Summary Statistics	
<u>Length</u>				
1-4	6	3.1		
5-9	102	52.6		
2--14	52	26.8		
15-19	7	3.6		
Unknown	27	13.9	$\bar{x}$	8.68 cm
			sd	2.63 cm
Totals	194	100.0	range	1-17 cm
<u>Width</u>				
1-2	2	1.0		
3-4	17	8.8		
5-6	65	33.5		
7-8	69	35.6		
9-10	26	13.4		
11-12	6	3.1		
Unknown	9	4.6	$\bar{x}$	6.75 cm
			sd	1.90 cm
Totals	194	100.0	range	1-12 cm
<u>Thickness</u>				
1	23	11.8		
2	87	44.8		
3	51	26.2		
4	22	11.3		
5	7	3.6		
6	1	0.5		
Unknown	3	1.5	$\bar{x}$	2.51 cm
			sd	1.00 cm
Totals	194	99.7	range	1-6 cm

Table 5.6. Manufacture of soft active abraders.

Type of Manufacture	No.	%
None	149	76.8
Flaked	20	10.3
Abraded	8	4.1
Pecked	9	4.6
Pecked and flaked	3	1.5
Pecked and abraded	2	1.0
Flaked, pecked, and abraded	1	0.5
Unknown	2	1.0
Totals	194	99.8
Amount of Work Invested		
None, unmodified	149	76.8
Slight	32	16.5
Moderate	10	5.2
Extensive	1	0.5
Unknown	2	1.0
Totals	194	100.0

Table 5.7. Characteristics of the primary use surface of soft active abraders.

Area (cm^2)	No.	%	Summary Statistics	
1-9	10	5.2		
10-19	15	7.7		
20-29	29	14.9		
30-39	49	25.3		
40-49	22	11.3		
50-59	21	10.9		
60-69	7	3.7		
70-79	2	1.0		
80-89	4	2.1		
90-99	2	1.0		
100-109	2	1.0		
140-149	1	0.5		
Unknown	30	15.5	$\bar{x}$	37.79 cm^2
			sd	20.99 cm^2
Totals	194	100.1	range	1-145 cm^2

Use Surface	Occurrence	%
1	91	46.9
2	78	40.2
3	10	5.2
4	8	4.1
5	5	2.6
6	1	0.5
9	1	0.5
Totals	194	100.0

Table 5.8. Other characteristics of primary use surfaces of soft active abraders.

Surface Contour	All No.	All %	Single Surface Only No.	Single Surface Only %
Irregular	27	7.7	7	7.7
Flat	168	48.1	48	52.7
Slightly concave	25	7.2	9	9.9
Concave	10	2.9	-	-
Slightly convex	71	20.3	16	17.6
Convex	48	13.7	11	12.1
Totals	349	99.9	91	100.0

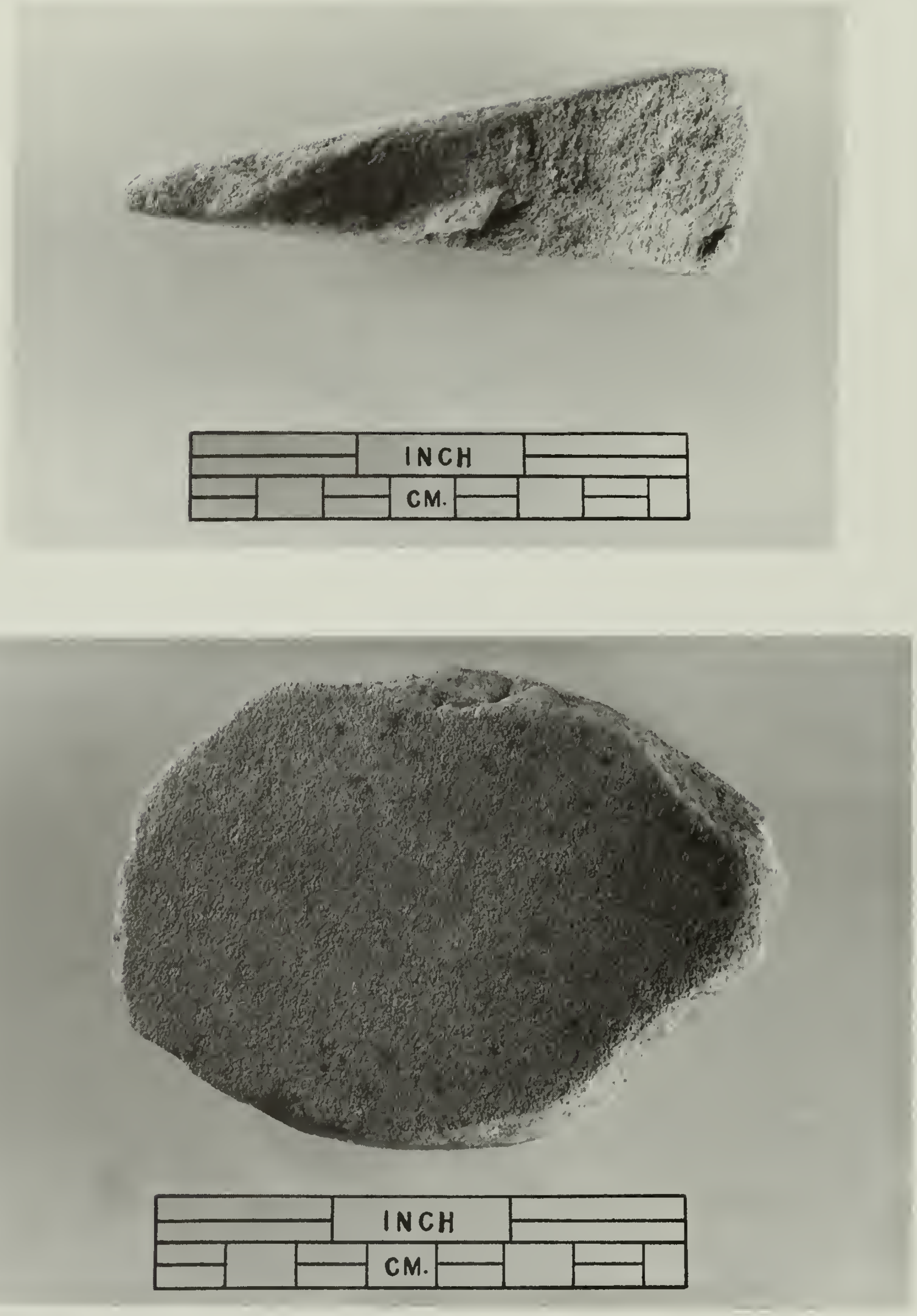
Location	Opposite or Angled	Adjacent non-right	Adjacent	Frequency
	-	-	-	94
	-	-	1	3
	-	-	2	2
	-	1	-	1
	-	2	-	1
	-	6	2	1
	1	-	-	74
	1	-	1	4
	1	-	2	5
	1	-	3	6
	1	-	4	1
	1	1	1	1
	2	-	-	1
Occurrence:	93	10	46	-

Table 5.9. Types of use on soft active abraders.

Primary Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	152	41	1	-	-
Cutting/gouging	167	18	9	-	-
Grinding/polish	-	-	-	-	194
Striations	96	60	38	-	-
Pecks[a]	180	5	5	-	-
Staining	188	3	1	2	-
Other	190	2	1	1	-

Secondary Use	No	%
None	65	33.5
Grooved abrader	6	3.1
Hammerstone	1	0.5
Chopper	20	10.3
Other	1	0.5
Unknown	101	52.1
Totals	194	100.0

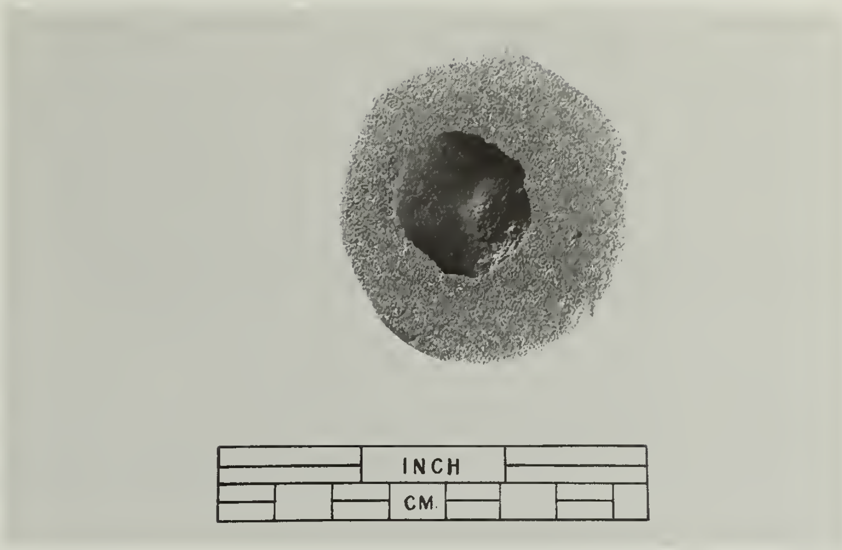
[a] Four soft active abraders had pecking that was characteristic of previous use and are not listed in this table.



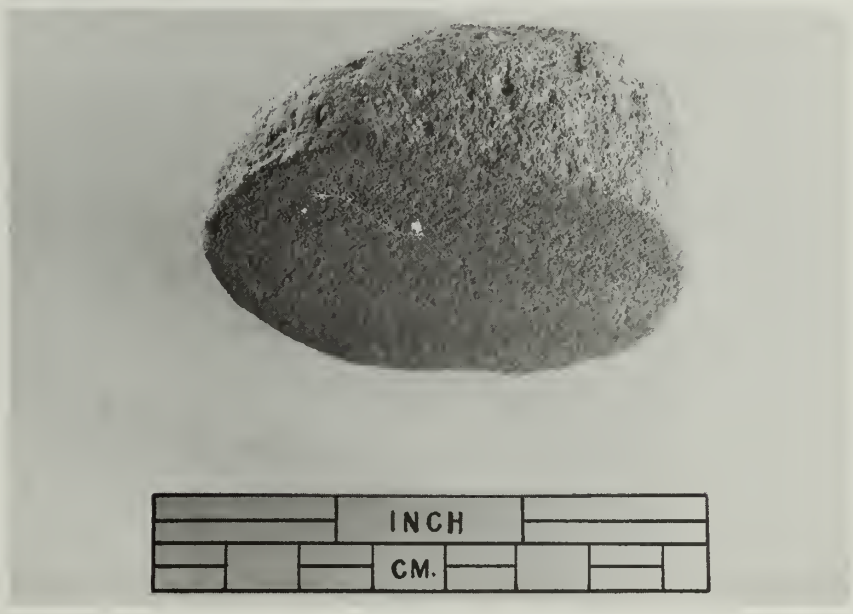
A

B

Figure 5.2 *Type 10: soft active abraders. Two views of an abrader from 29SJ 299, Pithouse B, southern rock fall (FS 282). (NPS Chaco Archive Negative No. 14316).*



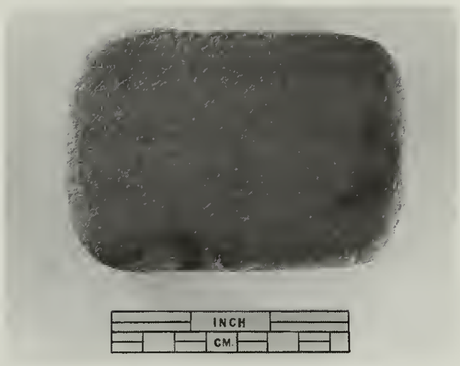
A



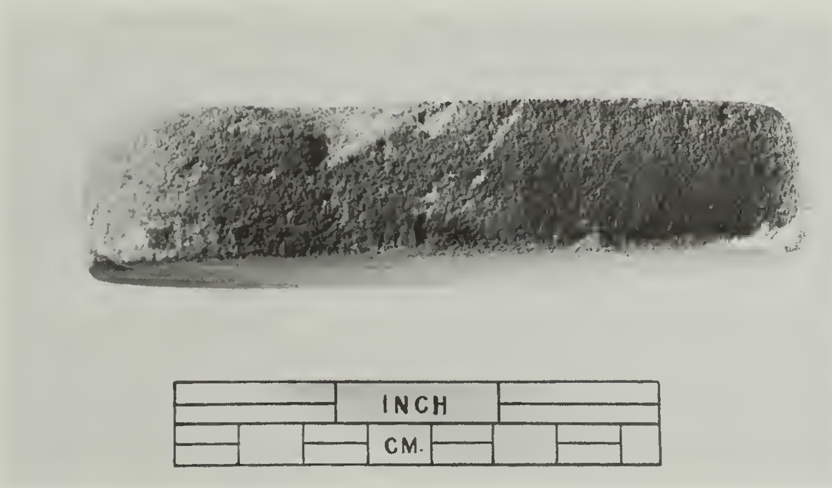
B

Figure 5.3. *Type 10: soft active abraders. A) A soft active abrader made from a small concretion. From 29SJ 299, Pithouse B, ventilator (FS 219). B) A soft active abrader from 29SJ 299, Pithouse A, Floor 1. (NPS Chaco Archive Negative Nos. 14282 and 14258B).*

Figure 5.4. *Type 10: soft active abraders. A) A soft active abrader from 29SJ 1360, Area 3, Upper Surface (FS 140). B) A soft active abrader from 29SJ 627, Room 16, Level 1 (FS 756). (NPS Chaco Archive Negative Nos. 14234A and 14328).*



A



B

Figure 5.5. *Type 10: soft active abraders. Two views of the same well-shaped soft active abrader from 29SJ 1360, Kiva B, Bench (FS 669). (NPS Chaco Archive Negative Nos. 14243F and 14243E).*

stone. He thought they would be good for shaping wood and when wet could reduce and polish stone.

Since soft abraders were most likely used for working soft and perishable materials, it is not surprising that few came from contexts that provide information on their use (see the section on site 29SJ 1360 for some suggestions on their use at that site). Of the 60 recovered from Pueblo Alto, 21 were found in the trash mound, suggesting they were not of great value and were not meant to be used and reused (Figures 5.2-5.5).

Type 10: Hard Active Abraders

The major type of active abraders is this group of undifferentiated active abraders made of hard sandstone. This group includes a number of functionally distinct tools and, thus, the description is not as tight as that of many for the other groups. Hard active abraders comprise the largest type in this analysis.

Dimensional Variables. When compared with the soft active abraders, the hard active abraders are slightly larger in all dimensions but the thickness. Tables 5.10 and 5.11 give the distributions of weights and measurements.

Material and Technology. The materials were all hard; as expected, hard or very hard sandstone, one quartzite, and two other stones (Table 5.12). These tools were placed in this group because their wear patterns and surface characteristics were more like those of active abraders than polishing stones. Table 5.13 documents the manufacturing techniques and amount of labor invested in hard active abraders.

When comparing the hard active abraders with the soft active abraders, slightly more of the hard abraders have a rectilinear shape, 37 percent as opposed to 28.4 percent. This is probably a function of the material; harder sandstone is more manufacturable. This also is seen in the manufacture variable where 76.8 percent of the soft abraders showed no evidence of manufacture, as compared with 65 percent of the hard abraders which were not modified (Table 5.13). More significant is the previous form variable (Table 5.14). Whereas the soft active abraders had none 88 percent of the time, the hard did not have a previous form in 37.4 percent of the cases.

Characteristics of the Use Surface. As with the soft active abraders, most of the hard active abraders were not heavily used. "Light" was recorded for 323 cases (56.5 percent), "medium" for 243 (43.5 percent), "heavy" for three (0.2 percent) and five were mixed (0.9 percent). The number of use surfaces for hard active abraders (Table 5.15) ranged from one to six, for a total of 885 use surfaces, an average of 1.5 per abrader.

Again, the surface contours (Table 5.16) may suggest a progression of wear; however, in this case, they are more likely to represent functional differences than those found in the soft abrader group. Other use surfaces are most often located on the opposite face or end of the artifact as shown in Table 5.16. Single surfaces and two surfaces, with the second located on the opposite face, are by far the most common configurations for hard active abraders. Table 5.16 records the kinds of use found on the primary use surfaces of hard active abraders. Striations are very typical and edge-rounding occurs in over half of the cases.

Secondary Use. The kinds of secondary use can be found in Table 5.17. More hard active abraders have secondary uses than the soft abraders; 39 percent as compared to 13 percent. This, along with the large percentage which had previous uses, suggests that good, hard sandstone was a resource utilized to its fullest. Of those used secondarily, 124 were lightly used, 96 moderately, and four heavily. Table 5.17 indicates the locations of secondary use.

Comments. Hard active abraders undoubtedly represent several functional categories of artifacts that were used for many tasks (Figures 5.6-5.9). Hard sandstone abraders could have been used for working a variety of materials, such as stone, as well as the smoothing of soft pliable materials like clay. Their smooth surfaces would not have been very efficient for grinding seeds but could have served to powder them once they were rendered into a meal-like consistency. Clays, pigments, and other stone tools were, in all likelihood, ground with these tools. The incidence of hard active abraders increases over time.

Table 5.10. Weights of hard active abraders.

Weight (g)	No.	%	Summary Statistics
1-199	129	22.6	
200-399	167	29.2	
400-599	82	14.3	
600-799	40	7.0	
800-999	26	4.5	
1000-1199	13	2.3	
1200-1399	6	1.0	
1400-1599	5	0.9	
Unknown	104	18.2	$\bar{x}$ 390.86 g
			sd 249.03 g
Totals	572	100.0	range 13-1562 g

Table 5.11. Dimensions of hard active abraders.

Dimensions cm)	No.	%	Summary Statistics
Length			
1-4	16	2.8	
5-9	175	30.6	
10-14	262	45.8	
15-19	31	5.4	
20-24	2	0.3	
Unknown	86	15.0	$\bar{x}$ 10.27 cm
			sd 2.80 cm
Totals	572	99.9	range 3-21 cm
Width			
1-2	3	0.5	
3-4	22	3.8	
5-6	118	20.6	
7-8	184	32.2	
9-10	121	21.2	
11-13	82	14.3	
Unknown	42	7.3	$\bar{x}$ 7.98 cm
			sd 2.23 cm
Totals	572	99.9	range 2-13 cm
Thickness			
1	69	12.1	
2	206	36.0	
3	199	34.8	
4	68	11.9	
5	11	1.9	
6	3	0.5	
7	2	0.3	
8	1	0.2	
Unknown	13	2.3	$\bar{x}$ 2.58 cm
			sd 1.02 cm
Totals	572	100.0	range 1-8 cm

Table 5.12. Materials of hard active abraders.

Material Type	No.	%
Hard sandstone	319	55.8
Very hard sandstone	250	43.7
Quartzite	1	0.2
Other stone	2	0.3
Totals	572	100.0

Table 5.13. Manufacture of hard active abraders.

Type of Manufacture	No.	%
None	372	65.0
Flaked	79	13.8
Abraded	7	1.2
Pecked	16	2.8
Flaked and abraded	9	1.6
Pecked and flaked	39	6.8
Pecked and abraded	7	1.2
All	16	2.8
Unknown	27	4.7
Total	572	99.9
Amount of Work Invested		
None, unmodified	372	65.0
Slight	86	15.0
Moderate	80	14.0
Extensive	6	1.0
Unknown	28	4.9
Totals	572	99.9

Table 5.14. Previous forms of hard active abraders.

Previous Form	No.	%
None	214	37.4
Concretion	14	2.4
River cobble	2	0.3
Mano	198	34.6
Metate	11	1.9
Abrader	3	0.5
Slab cover	4	0.7
Anvil	3	0.5
Other	7	1.2
Unknown	116	20.3
Totals	572	99.8

Table 5.15. Characteristics of the primary use surface of hard active abraders.

Area (cm^2)	No.	%	Summary Statistics
1-19	42	7.4	
20-39	141	24.6	
40-59	149	26.1	
60-79	65	11.4	
80-99	36	6.3	
100-119	28	4.9	
129-139	10	1.8	
140-159	2	0.4	
160-179	3	0.5	
200-219	1	0.2	
Unknown	95	16.6	$\bar{x}$ 51.96 cm^2
Totals	572	100.2	sd 30.17 cm^2 range 4-205 cm^2

Use Surface	Occurrences	%
1	313	54.8
2	225	39.4
3	21	3.7
4	8	1.4
5	3	0.5
6	2	0.4
Totals	572	100.2

Table 5.16. Other characteristics of primary use surfaces on hard active abraders.

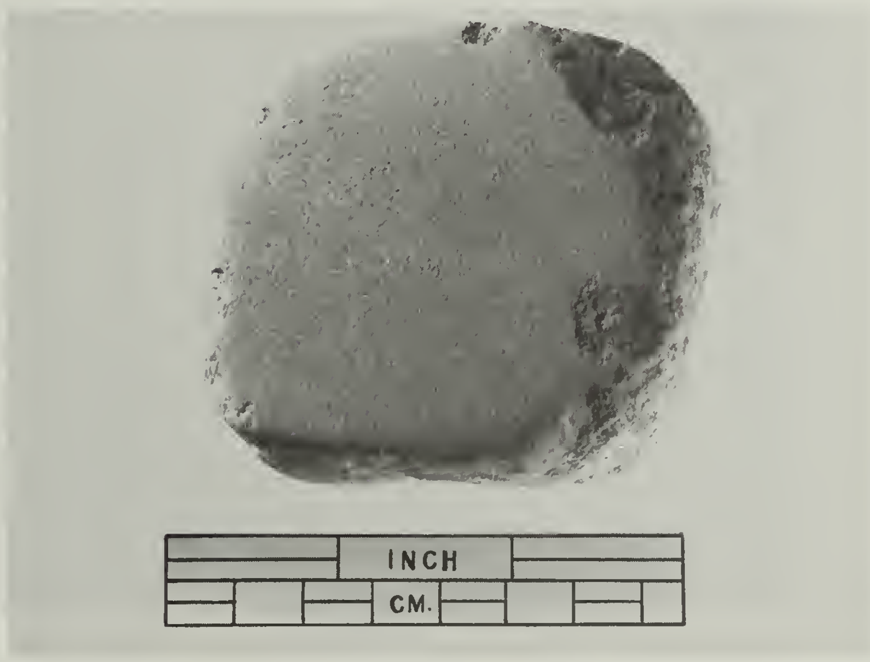
	All		Single Surface Only	
Surface Contour	No.	%	No.	%
Irregular	75	8.5	7	2.2
Flat	368	41.6	138	44.1
Slightly concave	41	4.6	11	3.5
Concave	8	0.9	2	0.6
Slightly convex	268	30.3	119	38.0
Convex	125	14.1	36	11.5
Totals	885	100.0	313	99.9

Location	Opposite or angled	Adjacent right	Adjacent non-right	Same plane parallel	Same plane random	Frequency
	-	-	-	-	-	312
	-	-	-	-	1	1
	-	-	-	1	-	1
	-	-	1	-	-	6
	-	1	-	-	-	6
	1	-	-	-	-	213
	1	-	-	-	1	1
	1	-	1	-	-	10
	1	-	2	-	-	4
	1	-	3	-	-	3
	1	-	4	-	-	2
	1	1	-	-	-	5
	1	1	1	-	-	2
	1	2	-	-	-	1
	2	-	-	-	-	5
Occurrence:	251	15	43	1	2	572

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	254	274	44	-	-
Cutting/gouging[a]	418	112	33	7	-
Grinding/polish	-	-	2	1	569
Striations	31	166	370	5	-
Pecks[b]	454	44	20	3	4
Staining	495	35	30	12	-
Other	571	-	1	-	-

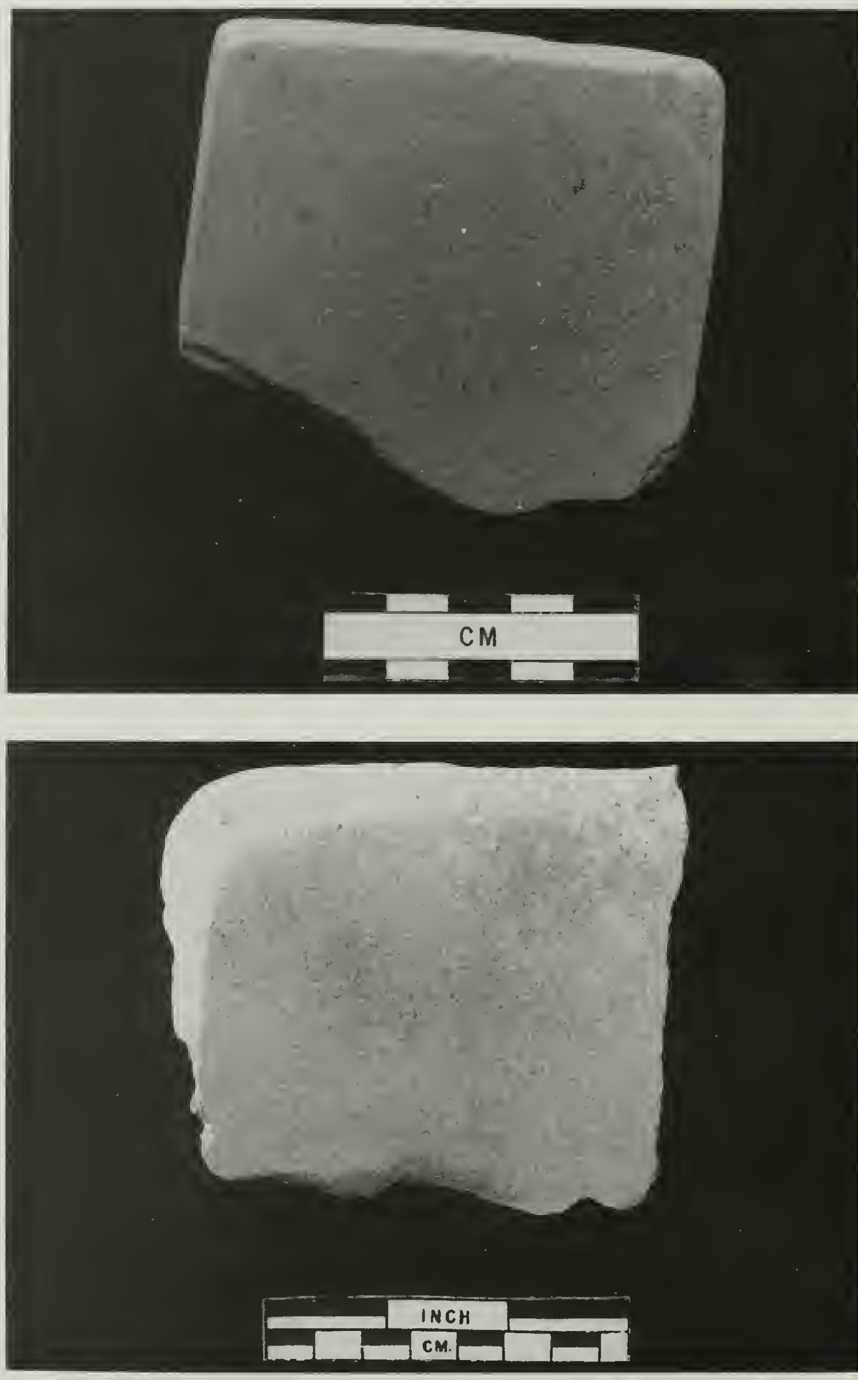
[a] Two hard active abraders had cutting and gouging that was characteristic of previous use and are not listed in this table.
[b] Forty-seven had pecking that was characteristic of previous use and are not listed in this table.

A



B

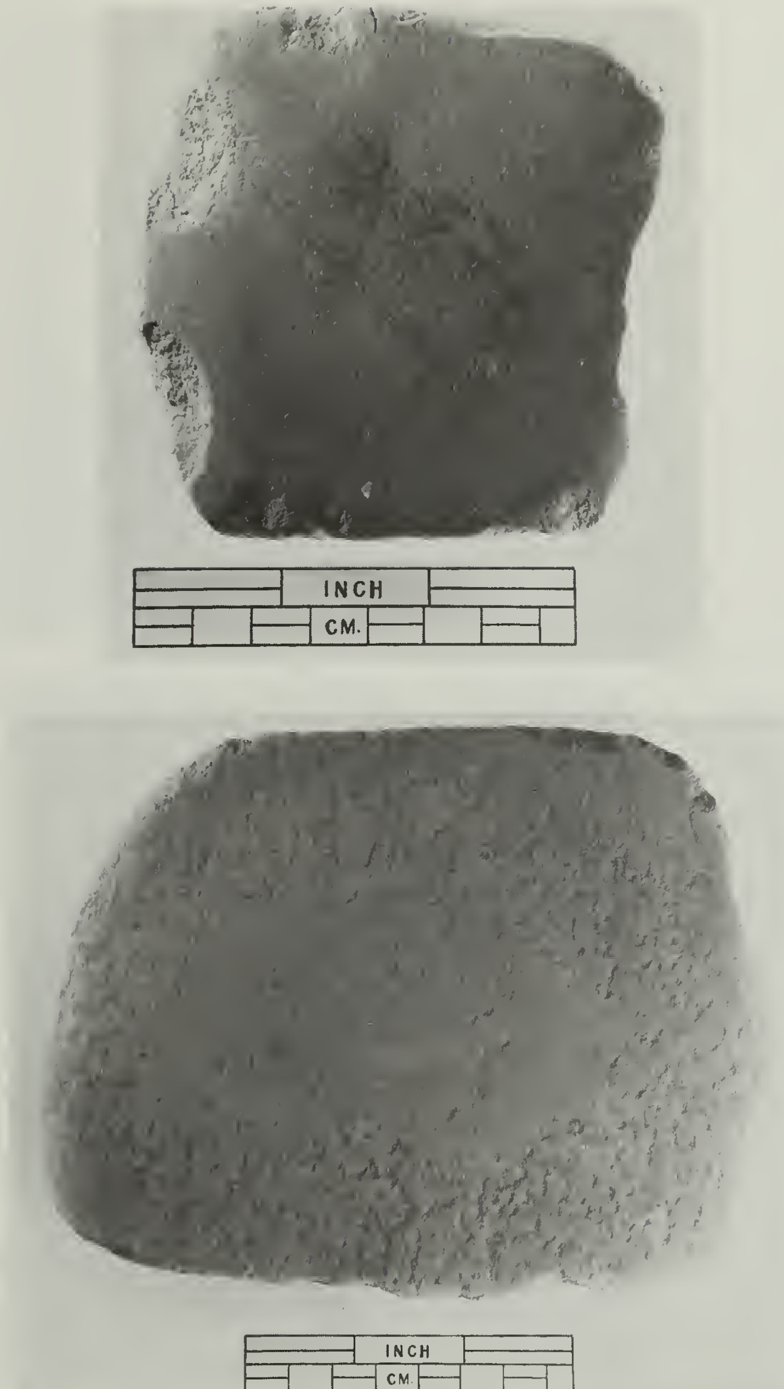
Figure 5.6. *Type 10: hard active abraders. A) A hard active abrader from 29SJ 627, Kiva E, Floor contact (FS 6807). B) A hard active abrader from 29SJ 627, found above Pithouse B (FS 1261). (NPS Chaco Archive Negative Nos. 14330 and 14266A).*



A

B

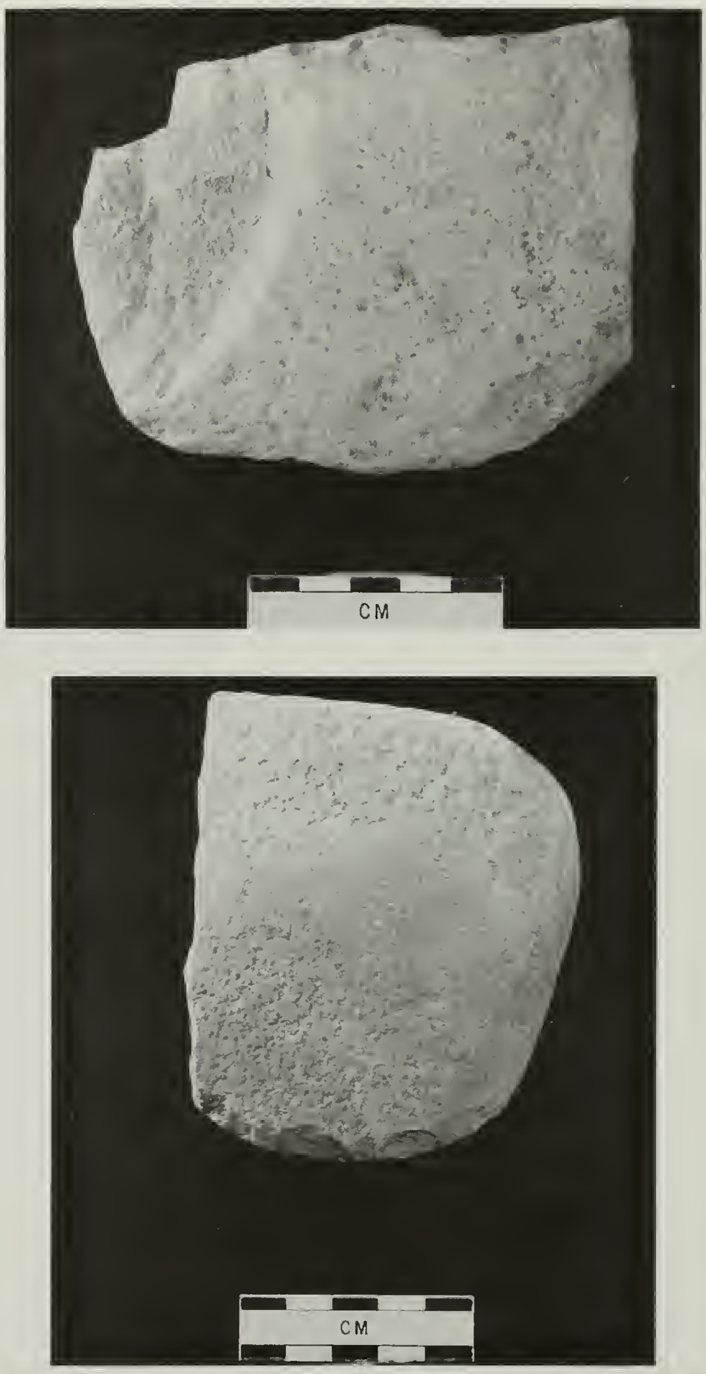
Figure 5.7. *Type 10: hard active abraders. A) A well-shaped hard active abrader from 29SJ 389, Other Structure 7, wall clearing (FS 464). B) A complete hard active abrader made from a mano fragment. 29SJ 389, Room 103, Layer 2, Level 2 (FS 1070). (NPS Chaco Archive Negative Nos. 16085A and 16062B).*



A

B

Figure 5.8. *Type 10: hard active abraders. A) A hard active abrader from 29SJ 1360, Kiva A, fill (FS 878). B) A mano reused as an active abrader. Note how the wear does not reach the edges of the artifact and that the striations parallel the length axis. 29SJ 628, Pithouse C, Antechamber Floor contact (FS 652). (NPS Chaco Archive Negative Nos. 14253A and 14262A).*



A

B

Figure 5.9. *Mano fragments reused as active abraders. A) A hard active abrader from 29SJ 633, Room 7, Floor 1 (FS 845). B) A hard active abrader from 29SJ 629, Plaza, Other Pit 14 (FS 3104). (NPS Chaco Archive Negative Nos. 18261 and 14192B).*

Table 5.17. Secondary use of hard active abraders.

Type of Use	No.	%
None	183	32.0
Pestle/cornbreaker	3	0.5
Hammerstone	32	5.6
Chopper	185	32.3
Architectural slab	1	0.2
Other	3	0.5
Unknown	165	28.8
Totals	572	99.9
Location		
Adjacent non-right angle	2	0.9
Adjacent right angle	169	75.4
Corners	20	8.9
Same plane	1	0.4
Whole artifact	1	0.4
Ends and edges	31	13.8
Totals	224	99.8

As discussed under the general site information (below), hard active abraders may have replaced polishing stones in functional terms.

Type 11: Faceted Active Abraders

This type was the first distinct group of active abraders to be defined. Familiarity with the stone circle abraders (Windes 1978a) allowed similar abraders to be pulled out from the start of this analysis. The faceted abraders are characterized by small edge facets which occur at adjacent non-right angles to the main use surface (called bevels by Windes). Only 40 of these were recovered from the excavations of habitation sites (Figures 5.10-5.12). The site distribution can be found in Table 5.18.

Dimensional Variables. Weights and dimensional variables are presented in Tables 5.19 and 5.20. The faceted abraders excavated from the habitation sites were not significantly different from those recovered by Windes from the stone circle sites. Table 5.21 compares the dimensions of the two groups. Both groups of abraders are small hand held tools which presumably had some specialized use which resulted in the facets.

Materials and Technology. A range of sandstones was found in faceted abraders. Soft sandstone was used for five (2.5 percent), medium sandstone three (7.5 percent), hard sandstone 12 (30 percent), and very hard sandstone 20 (50 percent) of the sample. Windes notes that, "Hard, light tan, tan-gray or dark brown rock was preferred over the softer white or light-tan sandstone found directly behind or under the stone circles" (1978a:46). Because softer sandstone was used for faceted abraders found in habitation sites, it is possible that these were not preserved in the shallow stone circle sites.

A large number of these faceted abraders were rectilinear in shape, 18 or 45 percent, some were circular (5 percent), 17 were other-shaped (42.5 percent), and three were unknown. Windes had a very similar shape distribution for the stone circle abraders.

Previous forms are more common in the habitation site sample; Windes reported that only 3.5 percent of those from stone circles had a previous use, compared to 7.5 percent of this sample (Table 5.22). Windes also found that 95.6 percent of the sample from stone circles was unmodified while only 65 percent of the habitation site sample had no modification (Table 5.22).

Two factors may account for the differences. Sandstone artifacts are better preserved when buried and there was a greater availability of discarded ground stone tools in habitation sites. Conversely, this may suggest that the abraders from the stone circle sites were quarried or collected for that purpose and transported to the sites rather than brought from "home." The amount of work invested in these abraders was rated as low; 17.5 percent were slight and 15 percent moderate.

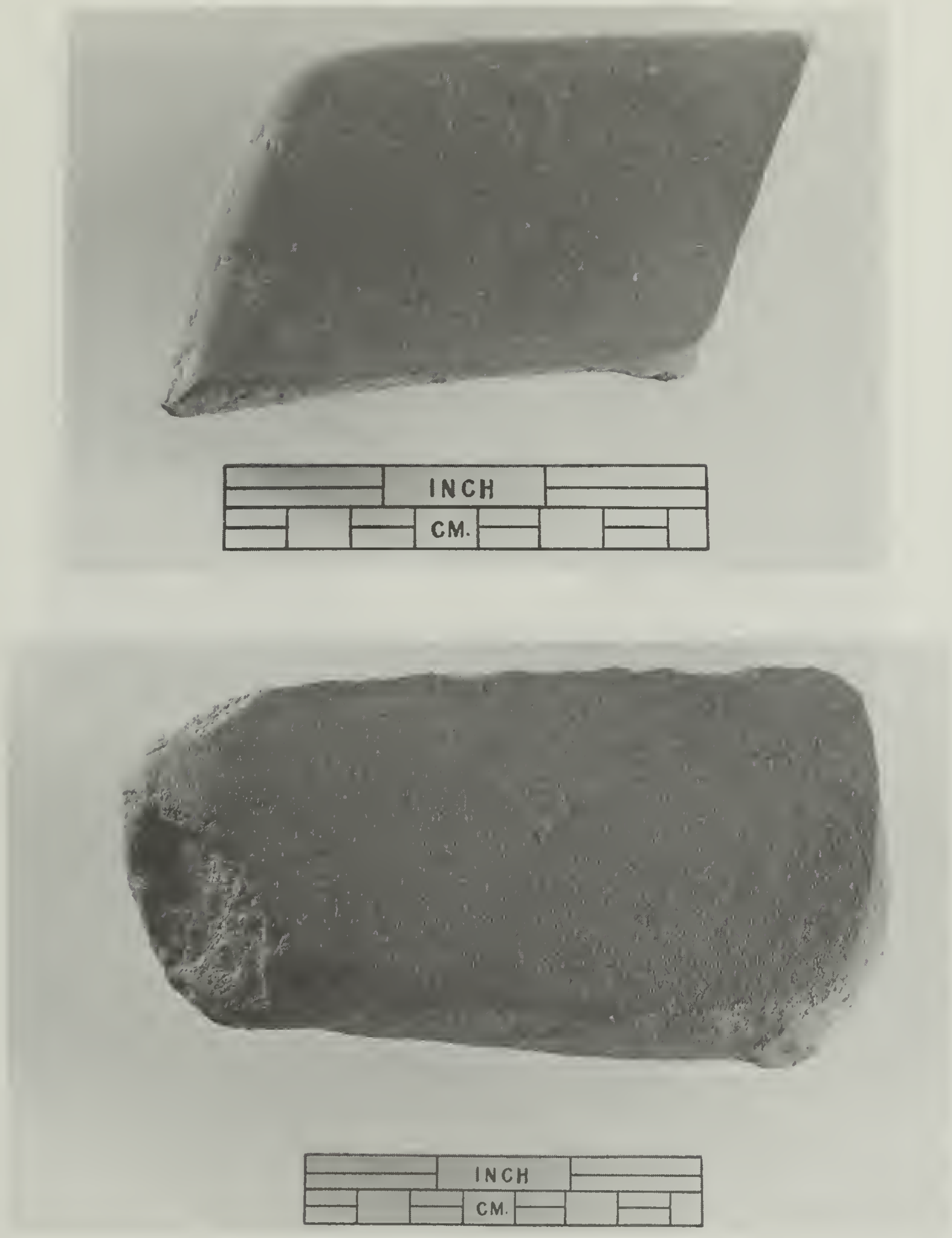
Characteristics of the Use Surface. Faceted abraders received a moderate amount of use. Eleven or 27.5 percent had light use and 29 or 72.5 percent moderate use (Table 5.23). For faceted abraders/bevels from stone circles, Windes notes a range in surface area between seven and 168, with a mean of 63.7 and standard deviation of 37.3.

One hundred and thirty-seven use surfaces were found ranging from one to 12 surfaces and averaging 3.4 surfaces per artifact. Four cases were found where only an edge facet was ground while the majority were unused. Table 5.24 gives the distribution of the number of use surfaces per artifact. The facets are most likely responsible for

A

B

Figure 5.10. *Type 11: faceted abraders. A) A faceted abrader from 29SJ 628, Pithouse D, Antechamber fill (FS 718). B) A soft faceted abrader from 29SJ 1360, Kiva A, Level 1 (FS 271). (NPS Chaco Archive Negative Nos. 14264 and 14320D).*



A

B

Figure 5.11. *Type 11: faceted abraders. A) A faceted abrader made from the corner of a passive abrader. 29SJ 627, Plaza west of Kiva D (FS 7048). B) A soft faceted abrader from 29SJ 627, Room 10, Floor 2 (FS 5134). (NPS Chaco Archive Negative Nos. 14329D and 14265).*

Figure 5.12. *Type 11: faceted abrader from 29SJ 389, Room 146, Layer 3 (FS 6002). (NPS Chaco Archive Negative No. 15848).*

Table 5.18. Site distribution of faceted abraders.

Site Number	No.	%
29SJ 299	1	2.5
29SJ 389	19	47.5
29SJ 391	2	5.0
29SJ 627	11	27.5
29SJ 628	1	2.5
29SJ 629	1	2.5
29SJ 633	1	2.5
29SJ 1360	4	10.0
Totals	40	100.0

Table 5.19. Weights of faceted abraders.

Weight (g)	No	%	Summary Statistics	
1-99	1	2.5		
100-199	9	22.5		
200-299	7	17.5		
300-399	8	20.0		
400-499	5	12.5		
500-599	2	5.0		
600 +	4	10.0		
Unknown	4	10.0	$\bar{x}$	370.94 g
			sd	294.98 g
Totals	40	100.0	range	66-1151 g

Table 5.20. Dimensions of faceted abraders.

Dimensions (cm)	No.	%	Summary Statistics
Length			
1-4	1	2.5	
5-9	11	27.5	
10-14	18	45.0	
15-20	7	17.5	
Unknown	3	7.5	x̄ 11.00 cm
			sd 3.27 cm
Totals	40	100.0	range 3-19 cm
Width			
3-4	1	2.5	
5-6	7	17.5	
7-8	17	42.5	
9-10	8	20.0	
11-12	6	15.0	
Unknown	1	2.5	x̄ 8.00 cm
			sd 2.04 cm
Totals	40	100.0	range 3-12 cm
Thickness			
1	5	12.5	
2	19	47.5	
3	3	7.5	
4	4	10.0	x̄ 2.35 cm
Unknown	9	22.5	sd 0.80 cm
Totals	40	100.0	range 1-4 cm

Note: Figures in tables could not be verified; errors may exist.

Table 5.21. Faceted abraders compared with stone circle abraders.

Measure	Site Sample	Stone Circle Sample[a]
Sample size	36	160
Mean weight	370.9	407.00
sd	295.0	70.56
Sample size	37	190
Mean length	11.0	11.4
sd	3.2	3.6
Sample size	37	190
Mean width	8.0	8.4
sd	2.0	2.1
Sample size	40	190
Mean thickness	2.3	3.0
sd	0.8	1.8

[a] Taken from Windes (1978a:47).

Table 5.22. Manufacture of faceted abraders.

Previous Form	No.	%
None	22	55.0
Mano	9	22.5
Other abraders	3	7.5
Unknown	6	15.0
Totals	40	100.0
Type of Manufacture		
Unmodified	26	65.0
Flaked	6	15.0
Abraded	1	2.5
Pecked	1	2.5
Flaked and abraded	1	2.5
Pecked and flaked	4	10.0
Flaked, pecked and abraded	1	2.5
Totals	40	100.0

Table 5.23. Characteristics of the primary use surface of faceted abraders.

Area (cm^2)	No.	%	Summary Statistics
1-9	2	5.0	
20-29	2	5.0	
30-39	7	17.5	
40-49	6	15.0	
50-59	7	17.5	
60-69	3	7.5	
70-79	4	10.0	
90-99	2	5.0	
100-109	2	5.0	
110+	2	5.0	
Unknown	3	7.5	$\bar{x}$ 57.13 cm^2
Totals	40	100.0	sd 34.51 cm^2 range 1-180 cm^2
Use Surface	Occurrences	%	
1	4	10.0	
2	7	17.5	
3	15	37.5	
4	7	17.5	
5	4	10.0	
6	1	2.5	
8	1	2.5	
12	1	2.5	
Totals	40	100.0	

Table 5.24. Other characteristics of use surfaces of faceted abraders.

Surface Contour	No.	%
Irregular	7	5.1
Flat	35	25.5
Slightly concave	5	3.6
Slightly convex	36	26.3
Convex	54	39.4
Totals	137	99.9

Location	Opposite or Angled	Adjacent Non-right	Adjacent Right	Same Plane Random	Frequency
	-	-	-	-	5
	-	-	-	2	1
	-	1	-	-	6
	-	1	1	-	3
	-	2	-	-	3
	-	3	-	-	1
	1	-	-	-	1
	1	1	-	-	7
	1	1	-	2	1
	1	2	-	-	6
	1	2	2	-	1
	1	3	-	-	1
	1	3	3	-	1
	1	6	4	-	1
	2	-	-	-	1
	2	3	-	-	1
Occurrence:	23	55	12	4	-

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	18	4	8	-	-
Cutting/gouging	27	8	5	-	-
Grinding/polish	-	-	-	-	40
Striations	2	6	32	-	-
Pecks[a]	35	2	2	-	-
Staining	36	3	1	-	-

[a] One had pecking that was characteristic of previous use and does not appear in this table.

the convex surfaces. The larger surfaces tend to be flat and slightly convex.

Table 5.24 shows that the edge facet is the most frequent location for the other use surfaces. Those on the same plane represent two side-by-side facets with no use on the larger surface. A total of 71 facets were found on the 40 artifacts, or 1.78 per abrader. During his analysis of bevels or faceted abraders from stone circles, Windes found 2.07 bevels per abrader for all sites and 1.9 for all but site 29SJ 1976B. A variety of other uses was found on the faceted abraders. If they did have a specialized function, this did not prevent the other kinds of use typical of active abraders.

Secondary Use. Sixteen or 40 percent of these abraders had no secondary use and 11 or 27.5 percent had an unknown secondary use. One was reused as a passive abrader, one as an anvil, two as hammerstones, and nine as choppers. In seven cases, this wear was light and in six cases it was moderate. The wear was located opposite the primary use surface once, at an adjacent right-angled edge 10 times, and once each on a same plane, on ends, or on edges.

Comments. The function of the faceted abraders is difficult to determine. They were used for one-handed active grinding and probably on something quite hard. Windes suggested those from the stone circle sites were used for working soft materials because few had striations. Only two of our cases did not show striations, suggesting that the preservation of the surfaces may have been a problem in his sample. The fact that these do occur

in habitation sites and throughout the time span suggests that the activities carried out at the stone circle sites were also done at habitation sites. There are some trends. Slightly more are found in the later sites, although the frequencies are always quite low, and they are not restricted to any particular provenience in the habitation sites.

Faceted abraders are not mentioned in the literature reviewed, other than the stone circle report. It is unlikely that they are unique to Chaco Canyon; the facets are small and could easily be missed.

Type 12: Active Lapidary Abraders

This group consists of an assortment of 25 abraders that are thought to have been used in lapidary or ornament manufacture. Some were assigned to this group because of the contexts in which they occurred and others were grouped because they were similar to those illustrated by Judd (1954) (Figures 5.13 and 5.14). They were found in a number of sites excavated by the Chaco Project (Table 5.25).

Dimensional Variables. Weights for active lapidary abraders are given in Table 5.26. The dimensional variables (Table 5.27) illustrate that this is not a homogenous tool category. In general, it consists of small file-like abraders and a larger group of rectilinear abraders.

Material and Technology. Several materials were used for active lapidary abraders (Table 5.28). The grain size was always fine or very fine for the sandstones. There was a tendency toward rectilinear shapes with 13 or 52 percent rectilinear, two or 8.0 percent circular, eight or 32 percent other and two unknown. The previous form was almost always natural with only one as a concretion.

The amount of work invested in the artifact was more than any group described so far. Only four were slightly modified, seven were moderately modified, eight were extensively modified and two were unknown.

Characteristics of the Use Surface. The degree of primary wear was usually medium with 22 or 88 percent of the artifacts; the remaining three were lightly used. None of these had just one use surface as Table 5.29 illustrates. Both faces and the edges were commonly used. One hundred use surfaces were found on the 40 abraders, for an average of 2.5 surfaces per abrader. As with most active abraders the predominant surface contours were flat and slightly convex (Table 5.30). The very convex surfaces are probably edges and facets. Table 5.30 suggests that not only is the opposite side always used, but quite often, also the edges.

Secondary Use. Secondary use of active lapidary abraders was rare; one was reused as a grooved abrader and another as a hammerstone. The amount of this use was light in the first instance and heavy in the other. The locations were on an adjacent right angle for the grooved abrader and the ends and edges for the hammerstone.

Comments. Of these 25 proposed active lapidary abraders, a large number were found with turquoise debris (Table 5.31) (Mathien, personal communication, 1980). Judd (1954:123) described a series of six "sandstone files," and stated that a Zuni worker in his crew who was also a jewelry-maker told him that they were used for shaping turquoise and other ornaments. Two of those from a workshop in Pithouse 2 of 29SJ 629 are similar to Judd's and were found with a large amount of turquoise debris. The filelike lapidary abraders are so small that they could easily be lost in most excavations and thus are rarely represented in collections.

The larger active lapidary abraders, similar to that in Figure 5.13, were more likely used for working larger pieces of turquoise mosaics or pendants where larger surfaces were polished. No active lapidary abraders were specifically described in the literature examined.

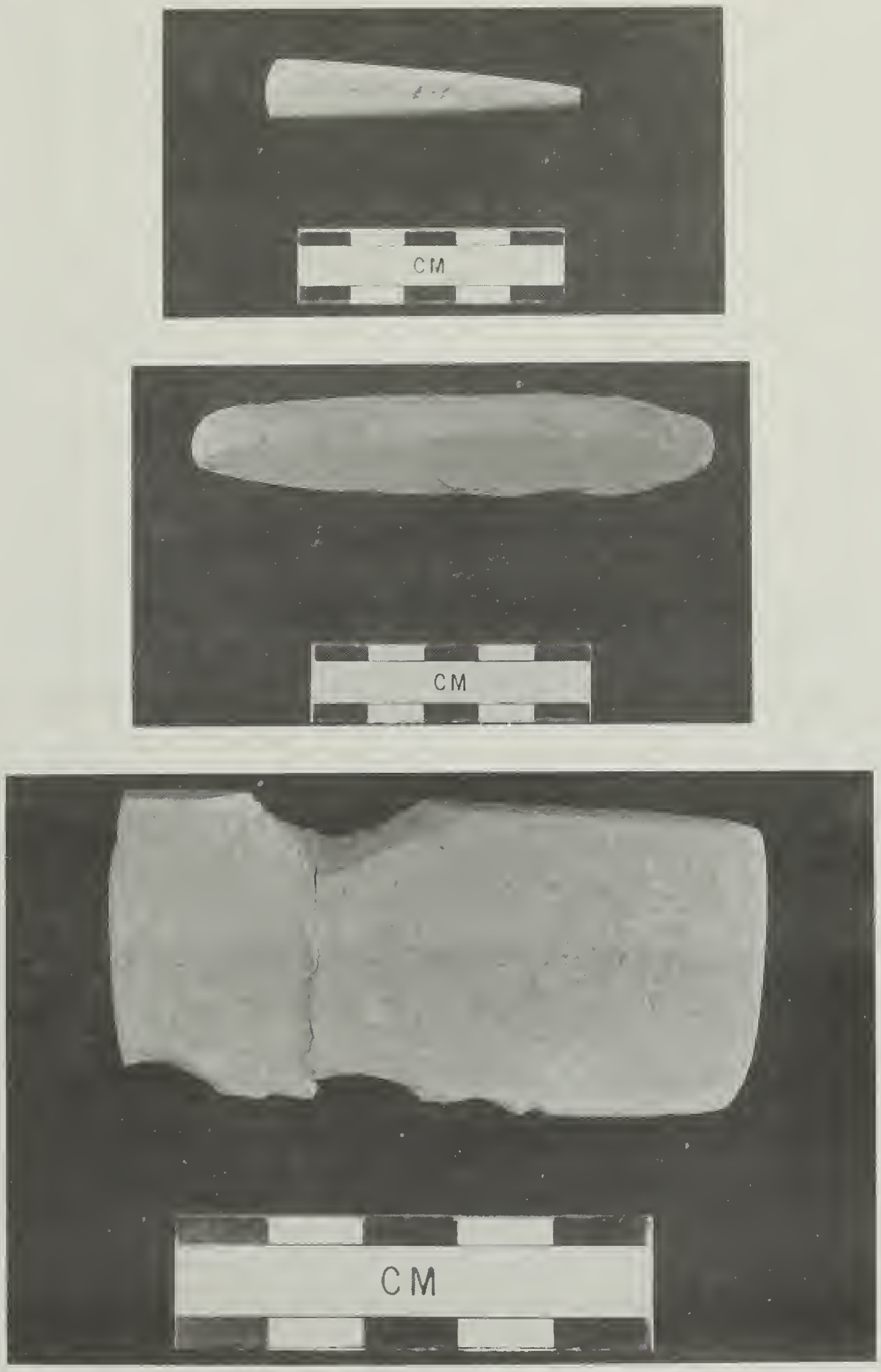
Type 13: Manolike Abraders

These active abraders were distinctive enough to merit their own type after the second year of analysis (Figures 5.15 and 5.16; Table 5.32). For that reason, manolike abraders occurring in sites other than 29SJ 389, 29SJ 391, and 29SJ 633 were lumped into the undifferentiated abrader category. It is my impression that these occur later in time, around mid-Pueblo II times; they were definitely present at 29SJ 627 and 29SJ 629.

A

B

Figure 5.13. *Type 12: active lapidary abraders. A) An active lapidary abrader of soft sandstone. The holes may have been made by a drill for making holes in ornaments. 29SJ 1360, Kiva B (FS 607). B) A red and grey banded sandstone active lapidary abrader. Note the anvil wear on the edge. 29SJ 627, Kiva D, Floor 1 (FS 5179). (NPS Chaco Archive Negative Nos. 14283D and 14274).*



A

B

C

Figure 5.14. *Type 12: active lapidary abraders. A) A filelike active lapidary abrader from 29SJ 629, Pithouse 2, Floor 2 (FS 3021). B) Another filelike active lapidary abrader from 29SJ 629, Pithouse 2, Floor fill (FS 2887). C) An active lapidary abrader from 29SJ 389, Room 142, Layer 5 (FS 2714). (NPS Chaco Archive Negative Nos. 14189B, 14279, and 15853).*

Table 5.25. *Site distribution of active lapidary abraders.*

Site Number	No.	%
29SJ 389	12	48.0
29SJ 391	3	12.0
29SJ 627	3	12.0
29SJ 629	5	20.0
29SJ 633	1	4.0
29SJ 1360	1	4.0
Totals	25	100.0

Table 5.26. *Weights of active lapidary abraders.*

Weight (g)	No.	%	Summary Statistics	
1-19	4	16.0		
20-39	2	8.0		
40-59	1	4.0		
100-199	1	4.0		
200-299	1	4.0		
300-399	1	4.0		
500-599	2	8.0		
800-899	1	4.0		
900-999	2	8.0		
Unknown	10	40.0	$\bar{x}$	309.27 g
			sd	359.08 g
Totals	25	100.0	range	6-916 g

Table 5.27. Dimensions of active lapidary abraders.

Dimensions (cm)	No	%	Summary Statistics	
Length				
1-2	-	-		
3-4	1	4.0		
5-6	4	16.0		
7-8	3	12.0		
9-10	3	12.0		
11-12	3	12.0		
13-14	2	8.0		
Unknown	9	36.0	x̄	8.56
			sd	-
Totals	25	98.0	range	3-13
Width				
1-2	5	20.0		
3-4	4	16.0		
5-6	2	8.0		
7-8	7	28.0		
9-10	4	16.0		
11-12	-	-		
13-14	-	-		
Unknown	3	12.0	x̄	5.45 cm
			sd	2.82 cm
Totals	25	100.0	range	1-9 cm
Thickness				
1	16	64.0		
2	2	8.0		
3	4	16.0		
4	1	4.0		
5	2	8.0	x̄	1.84 cm
			sd	1.31 cm
Totals	25	100.0	range	1-5 cm

Table 5.28. Manufacture of active lapidary abraders.

Material	No.	%
Soft sandstone	3	12.0
Hard sandstone	12	48.0
Very hard sandstone	7	28.0
Siltstone	2	8.0
Quartzite	1	4.0
Totals	25	100.0
Type of Manufacture		
Unmodified	4	16.0
Flaked	4	16.0
Abraded	8	32.0
Flaked and abraded	2	8.0
Pecked and abraded	3	12.0
Flaked, pecked and abraded	2	8.0
Unknown	2	8.0
Totals	25	100.0

Table 5.29. Characteristics of the primary use surfaces of active lapidary abraders.

Area (cm^2)	No.	%	Summary Statistics	
1-9	5	20.0		
10-19	1	4.0		
20-29	2	8.0		
30-39	1	4.0		
50-59	1	4.0		
60-69	1	4.0		
80-89	1	4.0		
90-99	1	4.0		
100-109	1	4.0		
120-129	1	4.0		
Unknown	10	40.0	$\bar{x}$	42.40 cm^2
			sd	41.41 cm^2
Totals	25	100.0	range	2-120 cm^2

Use Surface	Occurrences	%
2	7	28.0
3	4	16.0
4	3	12.0
5	6	24.0
6	4	16.0
8	1	4.0
Totals	25	100.0

Table 5.30. Other characteristics of primary use surfaces of active lapidary abraders.

Surface Contour	No.	%
Flat	28	28.0
Slightly concave	2	2.0
Concave	3	3.0
Slightly convex	31	31.0
Convex	36	36.0
Totals	100	100.0

Location	Opposite or Angled	Adjacent non-right	Adjacent right	Same plane parallel	Frequency
	-	-	1	-	1
	-	3	-	-	1
	1	-	-	-	6
	1	-	1	-	3
	1	-	2	-	3
	1	-	3	-	5
	1	-	4	-	3
	1	3	2	1	1
	1	5	-	-	1
	2	-	-	-	1
Occurrence:	23	11	38	2	-

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	13	8	4	-	-
Cutting/gouging[a]	17	3	4	-	-
Grinding/polish	-	-	-	1	24
Striations	5	5	14	1	-
Pecks	21	2	2	-	-
Staining	22	1	1	1	-
Other (drill holes)	24	-	-	1	-

[a] One had cutting and gouging that was characteristic of previous use and does not appear in this table.

Table 5.31. Associations of active lapidary abraders with turquoise debris.

Provenience		Debris	Modified debris	Unmod. bulk	Other
Pueblo Alto (29SJ 389)					
1	Room 139, fill	0	0	0	1 Bead
1	Room 142, fill	+	+	0	[a]
2	Kiva 10, fill	t	t	0	-
1	Kiva 15, construction	?	?	?	-
1	Plaza Grid 8	+	t	+	-
1	Plaza Grid 35	0	0	0	-
1	Plaza, Feature 1, Room 4	0	0	0	[b]
3	Trash Mound	?	?	?	-
Una Vida (29SJ 391)					
1	Room 19, floor	0	0	0	1 Bead
1	Room 23, floor	+	x	x	Inlay, pendant blank
1	Room 83, fill	t	t	0	-
29SJ 627					
1	Room 8, floor	0	t	t	-
1	Kiva D, floor	0	0	t	-
1	Kiva E, floor	t	0	t	-
29SJ 629					
1	Kiva, fill	+	0	0	-
3	Pithouse 2, fill and floor	x	t	x	-
1	Plaza Grid 14, OP 14	x	t	x	-
29SJ 633					
1	Room 7, Layer 2	t	0	0	-
29SJ 1360					
1	Kiva B, bench	x	+	0	Inlay, pendant blank

0 = absent t = trace 1-3 x = present 3-5 + = many 5+
[a] shell, shale and calcite debris.
[b] 16 shell bracelet fragments.

These are not just reused manos or mano fragments; they have a kind of wear that sets them apart from other reused manos. Surfaces are often polished to a glassy sheen and striations go with the long axis of the artifact. Sixty-two of these were identified, only 30 or 47.6 percent were complete.

Dimensional Variables. Weights (Table 5.33) and the dimensional variables (Table 5.34) show that manolike abraders are physically larger than any type of active abraders discussed so far. Additionally, they are designed for use with two hands more than any previous group.

Materials and Technology. All manolike abraders were manufactured of fine or very fine-grained, hard (18 or 29 percent) or very hard (44 or 71 percent) sandstone. Shape tended towards rectilinear or irregular. Twenty-one (33.9 percent) were rectilinear, one (1.6 percent) was circular, 26 were other-shaped (41.9 percent), and 14 (22.6 percent) were unknown.

Over half had no recognizable previous form, but when they did it was a mano (25 or 40.3 percent) or an abrader (1 or 1.6 percent). The large number that appeared to be unmodified (Table 5.35) included those which were previously manos and did not need further modification.

Characteristics of the Use Surface. None of these manolike abraders were lightly used (Table 5.36). Sixty or 96.8 percent were used moderately and two (3.2 percent) heavily. In the cases where there was previous mano use, light use would not obscure the mano wear and the artifact would have been analyzed as a mano or undifferentiated abrader. As noted earlier, the striations parallel the long axis of the abrader, whereas mano striations parallel the shorter axis.

One to three use surfaces are usual (Table 5.36); the three-sided abraders were triangular in cross-section. Slightly convex or convex surfaces are most descriptive of the manolike abraders (Table 5.37). As suggested by Table 5.37, it was not unusual to find these with a triangular or a flattened diamond cross-section.

Secondary Use. Secondary use was not uncommon and more were reused as chopping tools than anything else. The amount of wear was almost equally divided, with 13 indicating light wear and 15 indicating medium wear (Table 5.38). The secondary wear occurs on the edge of the artifact for the chopper, hammerstone and manolike slab uses; the opposite is true for the palette and the whole artifact for the architectural slab (Table 5.38).

Comments. These unusual abraders have generally been collected because they are so similar to manos but their different wear patterns and functions have been unrecognized or ignored. They often occur in proveniences with manos and could help in the maintenance of the mano and metate tool kit or in food preparation. The hardness and longitudinal striations suggest use on a hard material. Many of these are ground to a glossy sheen which could be a clue to their use.

A comparison with manos from sites in Chaco Canyon should help to establish their differences. In her analysis of manos, Cameron (1977, but see Chapter 3 of this volume) does not separate one-hand from two-hand manos, so the numbers compared are smaller than a comparison of just two-hand manos would be. Table 5.39 presents data on manos from 10 Chaco sites combined, 29SJ 627 alone, and the manolike abraders. It shows that, on the whole, manolike abraders are slightly smaller than the average mano, but there are overlaps.

Type 14: Stones Abraded for Pigment

Pigment stones resemble abraders in that they are chunks of colorful sandstone that are actively ground, but they have no manufacture and very little other wear on them. The resemblance to active abraders comes from the fact that they are ground against another rock to produce pigment or colored sand, and this leaves a flattened ground surface. In active abraders, the intent was to grind or shape another material, not to grind down the rock itself. All sixteen were complete. Table 5.40 indicates where these were found.

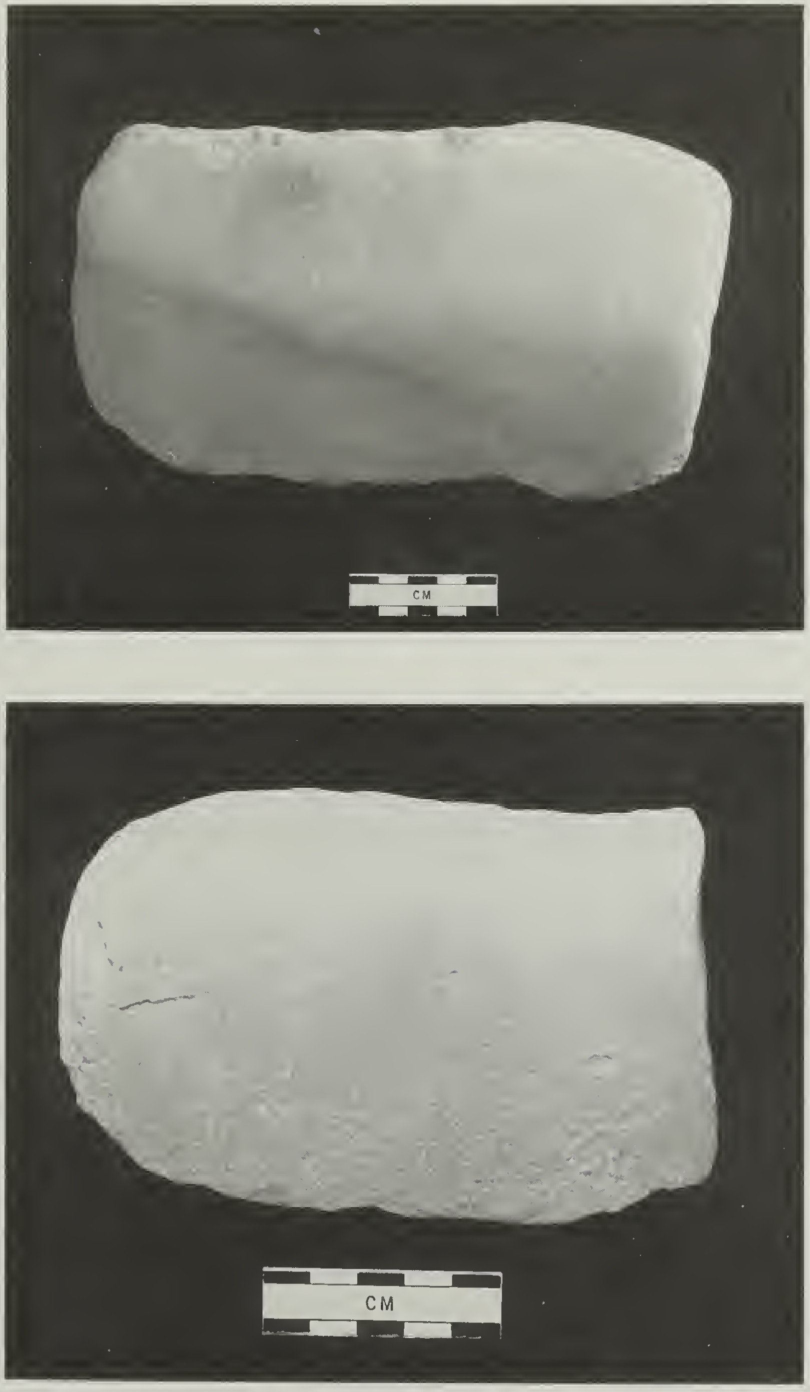
Dimensional Variables. There is a lot of size variability in this sample (Tables 5.41 and 5.42), especially the weight, which varies more than the tools' dimensions.

Material and Technology. Only one of these pigment abraders was burned. This suggests that the stone was located and selected on the basis of color

A

B

Figure 5.15. *Type 13: manolike abraders. A) A manolike abrader from 29SJ 391, Room 83, Fill (C24 2311). B) A manolike abrader from 29SJ 391, Room 18, First Story Fill (C 2109). (NPS Chaco Archive Negative Nos. 18323 and 18308).*



A

B

Figure 5.16. *Type 13: manolike abraders. A) A manolike abrader from 29SJ 391, Room 83, Floor 1 Construction (FS 101). B) A manolike abrader from 29SJ 389, Room 119, Wall Clearing (FS 124). (NPS Chaco Archive Negative Nos. 18301 and 16080A).*

Table 5.32. Site distribution of manolike abraders.

Site Number	No.	%
29SJ 389	54	87.1
29SJ 391	8	12.9
Totals	62	100.0

Table 5.33. Weights of manolike abraders.

Weight (g)	No.	%	Summary Statistics	
100-299	1	1.6		
300-499	11	17.7		
500-699	6	9.6		
900-1099	4	6.4		
1100-1299	2	3.2		
1500-1599	2	3.2		
1800-1899	2	3.2		
1900-1999	1	1.6		
Unknown	33	53.3	$\bar{x}$	790.10 g
			sd	523.54 g
Totals	62	99.8	range	153-1905 g

Table 5.34. Dimensions of manolike abraders.

Dimensions (cm)	No.	%	Summary Statistics
Length			
5-9	2	3.2	
10-14	15	24.2	
15-19	7	11.3	
20-24	5	8.1	
25	1	1.6	
Unknown	32	51.7	x̄ 15.17 cm sd 4.47 cm
Totals	62	100.1	range 9-25 cm
Width			
7-8	21	33.9	
9-10	22	35.5	
11-12	14	22.6	
Unknown	2	3.2	x̄ 9.03 cm sd 1.67 cm
Totals[a]	59	95.2	range 6-12 cm
Thickness			
1	2	3.2	
2	19	30.6	
3	26	41.9	
4	13	21.0	
5	2	3.2	x̄ 2.90 cm sd 0.88 cm
Totals	62	99.9	range 1-5 cm

[a] Three (4.8 percent) missing from table; dimensions unknown in 1994.

Table 5.35. Manufacture of manolike abraders.

Type of Manufacture	No.	%
Unmodified	29	46.8
Flaked	19	30.6
Pecked	3	4.8
Pecked and abraded	1	1.6
Pecked and flaked	3	4.8
Unknown	7	11.3
Totals	62	99.9
Amount of Work Invested		
None, unmodified	30	48.4
Slight	16	25.8
Moderate	7	11.3
Extensive	2	3.2
Unknown	7	11.3
Totals	62	100.0

Table 5.36. Characteristics of the primary use surface of manolike abraders.

Area (cm)	No.	%	Summary Statistics	
1-49	3	4.8		
50-99	14	22.6		
100-149	6	9.7		
150-199	3	4.8		
200-249	3	4.8		
250-200	1	1.6		
Unknown	32	51.6	$\bar{x}$	101.24 cm^2
Totals	62	99.9	sd	53.74 cm^2
			range	30-240 cm^2

Use Surface	Occurrences	%
1	14	22.6
2	19	30.7
3	22	35.4
4	3	4.8
5	2	3.2
6	1	1.6
8	1	1.6
Totals	62	99.9

Table 5.37. Other characteristics of primary use surfaces of manolike abraders.

	All		Single Surface Only	
Surface Contour	No.	%	No.	%
Irregular	4	2.5	1	6.6
Flat	50	32.5	3	20.0
Slightly concave	4	2.5	-	-
Slightly convex	58	37.7	5	33.3
Convex	38	24.6	6	40.0
Totals	154	99.8	15	99.9
Location	Opposite or angled	Adjacent non-right	Adjacent right	Frequency
	-	-	-	14
	-	1	-	9
	1	-	-	10
	1	-	1	1
	1	1	-	4
	2	-	-	17
	2	1	-	2
	2	2	-	1
	2	3	-	1
	3	-	-	1
	3	1	-	1
	3	2	2	1
Occurrence:	66	23	3	-

Table 5.38. Types of use on manolike abraders.

Primary Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	32	24	6	-	-
Cutting/gouging	39	19	3	1	-
Grinding	-	-	-	-	62
Striations	-	2	56	4	-
Pecks	59	1	2	-	-
Staining	59	1	2	-	-
Secondary Use	No.	%			
None	17	27.4			
Palette	1	1.6			
Hammerstone	1	1.6			
Chopper	23	37.1			
Manolike slab	2	3.2			
Architectural slab	1	1.6			
Unknown	17	27.4			
Totals	62	99.9			

Table 5.39. Comparison of Chaco manos and manolike abraders.

Measure	10 Site Manos	29SJ 627 Manos	Manolike Abraders
Sample size	494	200	62
Mean weight	1154.3	1198.1	790.1
sd	522.1	501.4	523.5
Range	342-3265	363-3266	153-1905
Mean length	18.2	18.6	15.2
sd	2.8	2.4	4.4
Range	8.6-27.5	9.2-24.0	9-25
Mean width	11.0	11.1	9.0
sd	1.3	1.2	1.6
Range	1-14.1	7.6-14.1	6-12
Mean thickness	3.1	3.2	2.9
sd	1.0	0.9	0.8
Range	0.7-12.7	1-5.7	1-5

Table 5.40. Site distribution of pigment abraders.

Site Number	No.	%
29SJ 389	3	18.8
29SJ 390	1	6.3
29SJ 627	6	37.5
29SJ 628	4	25.0
29SJ 629	1	6.3
29SJ 1360	1	6.3
Totals	16	100.2

(Table 5.43), rather than attempting to achieve a desired color by alteration through burning of the more abundant sandstones.

Pigment abraders are generally made of softer sandstones, but some harder ones were found. Six each were soft and medium sandstones (37.5 percent), and two each were hard and very hard sandstones (12.5 percent). All were fine or very fine-grained stones.

Shapes varied with four rectilinear (25.0 percent), six circular (37.5 percent), and six other-shaped. Nine had no previous form (56.3 percent), and seven were concretions (43.8 percent). None were modified before they were used.

Characteristics of the Use Surface. Half of these pigment abraders were ground slightly and the rest were moderately ground (Table 5.44). The pigment abraders had either one or two ground surfaces. Fourteen had a single surface (88.2 percent) and two had double ground surfaces. Those with two ground surfaces were both located on the opposite face. Although these are not primarily tools, the wear on the use surfaces suggests that they were used from time to time.

Secondary Use. Only one of these was used secondarily as a chopper. The use was light and on an adjacent right-angle edge.

Comments. Only one of these was found in primary use context, and it was on a floor littered with trash from the fill above. Pigment abraders do not seem to be highly coveted objects but casually used and discarded. No mention of similar objects was found in the literature reviewed.

Type 15: Paint Grinders

Paint grinders are active grinding tools defined by a covering of pigment which obviously resulted from use as the active part of a pigment grinding kit. They were separated to look at the variability in stones used for this purpose. The main criteria that separated these from the undifferentiated active abraders was the covering of the entire surface with pigment, as opposed to only a small area of pigment (Figure 5.17). Thirteen of these were found (Table 5.45); 12 or 92.3 percent were complete.

Dimensional Variables. No standard weight or size are evident for this group (Tables 5.46 and 5.47). This is largely due to the fact that they do not seem to be manufactured for the purpose of grinding

Table 5.41. Weights of pigment abraders.

Weight (g)	No	%	Summary Statistics	
1-99	4	24.6		
100-199	6	37.8		
200-299	3	18.9		
300-399	1	6.3		
800-899	1	6.3		
900-999	1	6.3	x̄	256.37 g
			sd	254.46 g
Totals	16	100.2	range	10-907 g

Table 5.42. Dimensions of pigment abraders.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
1-4	1	6.3		
5-9	9	56.2		
10-14	6	37.5	x̄	8.75 cm
			sd	2.81 cm
Totals	16	100.0	range	3-14 cm
Width				
1-2	1	6.3		
5-6	7	43.6		
7-8	5	31.3		
9-10	1	6.3		
11-12	2	12.6	x̄	6.80 cm
			sd	2.29 cm
Totals	16	100.1	range	2-11 cm
Thickness				
1	3	18.8		
2	3	18.8		
3	6	37.5		
4	3	18.8		
6	1	6.3	x̄	2.81 cm
			sd	1.33 cm
Totals	16	100.2	range	1-6 cm

Table 5.43. Colors of pigment abraders.

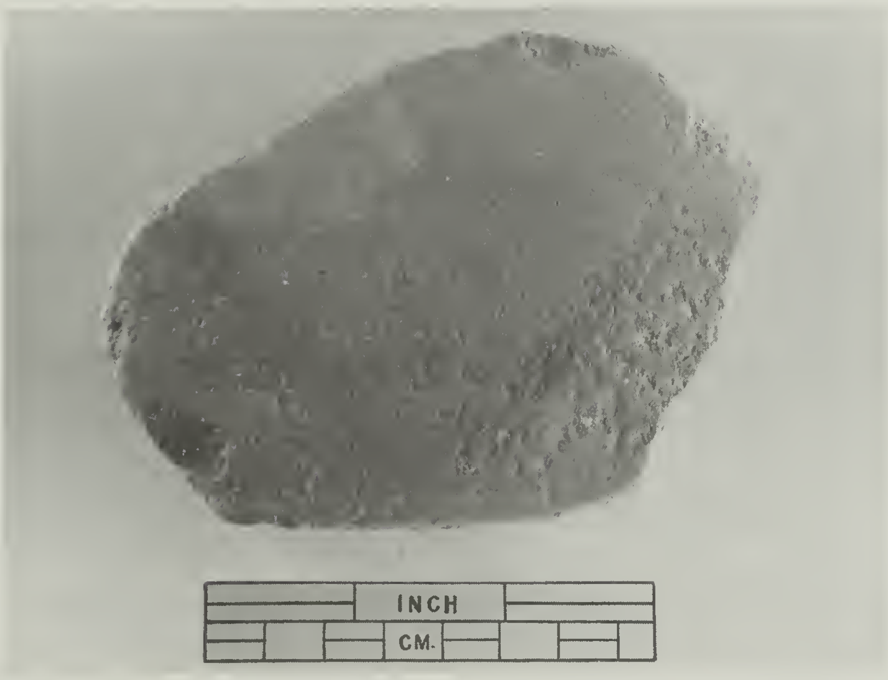
Color	Munsell Color Code	No.	%
Reds:	10 R 4/2	3	18.8
	10 R 3/4	5	31.3
	10 R 4/6	2	12.6
Yellows:	10 YR 7/4	1	6.3
	10 YR 5/4	1	6.3
	10 YR 6/6	3	18.8
	5 Y 8/4	1	6.3
Totals		16	100.4

Table 5.44. Characteristics of the primary use surface of pigment abraders.

Area (cm²)	No.	%	Summary Statistics		
1-19	5	31.3			
20-39	5	31.3			
40-59	3	18.8			
60-79	1	6.3			
80-99	2	12.6	$\bar{x}$ 36.25 cm²		
			sd 28.18 cm²		
Totals	16	100.3	range 5-96 cm²		
Surface Contour					
Irregular	1	5.5			
Flat	11	61.1			
Slightly convex	3	16.7			
Convex	3	16.7			
Totals	18	100.0			
Types of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	15	1	-	-	-
Cutting/gouging	14	2	-	-	-
Grinding/polish	-	-	-	-	16
Striations	10	3	3	-	-
Pecking	13	2	-	1	-
Staining	15	-	1	-	-

Note: Figures in tables could not be verified; errors may exist.

A



B

Figure 5.17. *Type 15: paint grinders. A) A paint grinder from 29SJ 628, Pithouse E, Level 2 (FS 345). B) A paint grinder from 29SJ 1360, Kiva B, Wall Construction (FS 812). (NPS Chaco Archive Negative Nos. 14251A and 14322B).*

Table 5.45. Site distribution of paint grinders.

Site Number	No	%
29SJ 299	2	15.4
29SJ 389	6	46.2
29SJ 627	3	23.1
29SJ 628	1	7.7
29SJ 1360	1	7.7
Totals	13	100.1

Table 5.46. Weights of paint grinders.

Weight (g)	No.	%	Summary of Statistics	
100-199	2	15.4		
200-299	3	23.1		
400-499	4	30.8		
500+	4	30.8	x̄	411.50 g
			sd	211.66 g
Totals	13	100.1	range	176-874 g

Table 5.47. Dimensions of paint grinders.

Dimensions (m)	No.	%	Summary Statistics	
Length				
5-6	-	-		
7-8	2	15.4		
9-10	2	15.4		
11-12	2	15.4		
13-14	2	15.4		
15-16	3	23.1		
17-18	3	23.1		
Unknown	1	7.7	x̄	12.33 cm
			sd	3.31 cm
Totals	15	115.5	range	8-17 cm
Width				
5-6	1	7.7		
7-8	7	53.9		
9-10	3	23.1		
11-12	1	7.7		
13-14	-	-		
15-16	-	-		
17-18	-	-	x̄	8.25 cm
Unknown	1	7.7	sd	1.36 cm
Totals	13	100.1	range	6-11 cm
Thickness				
2	5	38.5		
3	6	46.2	x̄	2.77 cm
4	2	15.4	sd	0.72 cm
Totals	13	100.1	range	2-4 cm

Note: Figures in tables could not be verified; errors may exist.

Table 5.48. Characteristics of the primary use surface of paint grinders.

Area (cm²)	No.	%	Summary Statistics	
30-39	4	30.8		
50-59	1	7.7		
60-69	2	15.4		
70-79	1	7.7		
80-89	2	15.4		
110-119	1	7.7		
130-139	1	7.7		
Unknown	1	7.7	$\bar{x}$	66.67 cm²
			sd	31.24 cm²
Totals	13	100.1	range	30-130 cm²

Type of Use	Absent	Light	Moderate	Heavy	Characteristic
Edge-rounding	13	-	-	-	-
Cutting/gouging	12	1	-	-	-
Grinding/polish	-	-	-	-	13
Striations	2	2	9	-	-
Pecks	13	-	-	-	-
Staining	-	-	-	-	13

pigment but are instead pieces of other artifacts modified for that purpose.

Materials and Technology. The material was generally sandstone with one (7.7 percent) soft sandstone, three (23.1 percent) were hard sandstone, eight (61.5 percent) were very hard sandstone, and one was quartzite. The grain size was fine or very fine. None were rectilinear in shape, three were circular (23.1 percent) and nine (69.2 percent) were other shapes. One was unknown.

Only one had no previous form, one was a metate, and ten (76.9 percent) had been manos. One other was unknown. Manufacture was common, although six had none (46.2 percent). Four were flaked (30.8 percent), and three (23.1 percent) were pecked. The modification was slight in one case and moderate in six cases.

Characteristics of the Use Surface. The degree of primary wear was most often moderate, ten or 76.9 percent (Table 5.48). The remaining three showed light wear (23.1 percent). All had either one or two use surfaces; seven had one, and six had two. All secondary surfaces were located on the opposite face. The surface contours included one irregular (5.2 percent), three flat (15.8 percent), ten slightly convex (52.6 percent), and five convex (26.3 percent).

Secondary Use. Seven (53.8 percent) of the paint grinders were used secondarily as choppers, possibly for breaking up the larger pieces of pigment. The rest were not reused or it could not be determined. Secondary use was recorded as light for one and moderate for the others. The use was located on an adjacent right-angle edge and once on both ends and edges.

Comments. Other researchers have commented that abraders or discarded manos have been used for grinding pigment, but they have not been looked at as a group. They are fairly close in size, material, and other features, indicating some selection for a combination of features—such as one- or two-handed manos initially.

Type 16: Edge Abraders

This kind of abrader was separated because it was so unusual. Instead of the use surface being on the largest plane of the object, it is located on the edge. The large planes are generally unutilized.

Twenty four of these were identified (Table 5.49); eleven (45.8 percent) of these were complete.

Dimensional Variables. A look at the weights and dimensional variables (Tables 5.50 and 5.51) reveals that edge abraders are generally quite small

Table 5.49. Site distribution of edge abraders.

Site Number	No.	%
29SJ 389	14	58.3
29SJ 627	4	16.7
29SJ 629	2	8.3
29SJ 633	1	4.2
29SJ 1360	3	12.5
Totals	24	100.0

Table 5.50. Weights of edge abraders.

Weight (g)	No.	%	Summary Statistics	
1-49	4	16.8		
50-99	2	8.4		
150-199	2	8.4		
250-299	1	4.2		
300-349	1	4.2		
350-399	1	4.2		
Unknown	13	54.2	x̄	142.09 g
			sd	135.61 g
Totals	24	100.4	range	18-375 g

Table 5.51. Dimensions of edge abraders.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
1-2	-	-		
3-4	1	4.2		
5-6	5	20.9		
7-8	1	4.2		
9-10	2	8.4		
11-12	1	4.2		
13-14	1	4.2		
Unknown	13	54.2	x̄	7.63 cm
			sd	3.01 cm
Totals	24	100.3	range	4-13 cm
Width				
1-2	1	4.2		
3-4	3	12.5		
3-5	5	20.9		
7-8	2	8.4		
9-10	3	12.5		
11-12	-	-		
13-14	-	-		
Unknown	10	41.7	x̄	6.07 cm
			sd	2.16 cm
Totals	24	100.2	range	2-9 cm
Thickness				
1	13	54.2		
2	6	25.0		
3	4	16.7		
			x̄	1.61 cm
			sd	0.78 cm
Totals	24	95.9	range	1-3 cm

Note: Figures in tables could not be verified; errors may exist.

stones; the largest was 9-by-13-cm. A suggested function is building stones with the facing edge ground. Other characteristics of these stones, however, suggest that this was not the case.

Materials and Technology. A variety of sandstones were used for these abraders (Table 5.52). Grain size was fine or very fine. The plan view was rectilinear six times (25.0 percent), "other" seven times (29.2 percent), and indeterminate 11 times (45.8 percent). Twenty of these (83.3 percent) had no previous form; one was thought to have been a slab cover fragment, and three (12.0 percent) were indeterminate. Nineteen of these were definitely unmodified, three were indeterminate, and two (8.3 percent) were flaked. Modification was moderate in both cases.

Table 5.52. Materials of edge abraders.

Material	No.	%
Soft sandstone	3	12.5
Medium sandstone	4	16.7
Medium-hard sandstone	12	50.0
Hard sandstone	5	20.8
Totals	24	100.0

Characteristics of the Use Surface. Fifteen (62.5 percent) of the edge abraders were lightly used and two were moderately used. The number of use surfaces varies from one to five for a total of 47 use surfaces and an average of 1.9 per edge abrader (Table 5.53).

Because half of these had more than one ground edge, it seems reasonable to suggest that they were more than building stones. Few building stones from the small sites were ground at all, and there would have been little reason to grind more than the exposed face in any case. Also, flat faces would be expected if the stones were being faced; this is not the case, most are convex or slightly convex (Table 5.54). The locations of the other use surfaces included six opposite, two adjacent non-right angles, and 16 right angles.

Secondary Use. Only three edge abraders had a definite secondary use; one as a passive abrader and two as choppers. The use was rated light for two of these and moderate for the other. All secondary use was located on adjacent right-angle surfaces.

Comments. If the edge abraders were building stones, as opposed to tools, we would expect to find them high in the wall-fall layer or in wall clearing proveniences. Enough of these have proveniences other than wall clearing or wall-fall to question their use as building stones; in fact, they are evenly distributed across the sites (Table 5.55). No descriptions of edge abraders were found in the literature reviewed, but Judd (1954) does list as active abraders a group he calls "spalls with worn edges" that sound quite similar.

Type 17: Cornbreaker Abrader

Objects thought to have been used as initial cornbreakers are relatively common but usually had no abrasion and were analyzed with the other-shaped stone. Those described here are largely active abraders, presumably used in a corn grinding tool kit. Only two of these were found in our excavations, one at 29SJ 627 in Room 8, Floor 1 contact, and the other at 29SJ 633 in the fill of Room 7. The two are very similar in most aspects and undoubtedly served similar purposes, probably the breaking up of large kernels of corn. The one from 29SJ 627 was flat, tabular, and mano-sized, but with very smooth faces and, unlike a mano, all the edges were well-rounded. It was found in a tool kit along with manos, hammerstones, and other corn grinding equipment.

The sample size is so small that any descriptions should not be considered as definitive. Both were complete.

Dimensional Variables. Dimensions are provided in Table 5.56.

Material and Technology. Both cornbreaker abraders are very hard sandstone, fine or very fine-grained and rectilinear in shape. Neither had a previous form. Pecking and abrading were used in the manufacture to a moderate extent for one and extensive for the other.

Characteristics of the Use Surface. One of these cornbreaker abraders was used only slightly and the other moderately. The areas of the primary use surfaces were 32 and 75 cm^2 for an average of 53.5 cm.

One had six use surfaces and the other had three. The surface contours were as follows: one ir-

Table 5.53. Characteristics of the primary use surface on edge abraders.

Area (cm^2)	No	%	Summary Statistics	
1-4	6	25.0		
5-9	2	8.3		
10-14	2	8.3		
25-29	1	4.2		
45-49	1	4.2		
Unknown	12	50.0	$\bar{x}$	10.25 cm^2
			sd	13.90 cm^2
Totals	24	100.0	range	2-48 cm^2

Use Surface	Occurrences	%
1	12	50.0
2	6	25.0
3	2	8.3
4	3	12.5
5	1	4.2
Totals	24	100.0

Table 5.54. Other characteristics of use surfaces of edge abraders.

Surface Contour	Number	Percent
Irregular	7	14.9
Flat	2	4.2
Slightly concave	1	2.1
Slightly convex	17	36.2
Convex	20	42.5
Totals	47	99.9

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	22	-	2	-	-
Cutting/gouging	24	-	-	-	-
Grinding/polish	-	-	-	-	24
Striations	5	12	7	-	-
Pecks	24	-	-	-	-
Staining	22	1	1	-	-

Table 5.55. Within site locations of edge abraders.

Location	No.	%
Wall clearing	5	20.8
Fill	6	25.0
Floor fill/floor contact	5	20.8
Plaza proveniences	4	16.7
Trash area	4	16.7
Totals	24	100.0

Table 5.56. Dimensions of cornbreaker abraders.

	Weight (g)	Length (cm)	Width (cm)	Thickness (cm)
	823	10	7	5
	1,281	17	7	7
x̄	1,052	13.5	7	6
sd	323.85	4.95	0	1.4

Table 5.57. Use on cornbreaker abraders.

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	-	2	-	-	-
Cutting/gouging	-	-	1	1	-
Grinding/polish	-	-	-	-	2
Striations	1	1	-	-	-
Pecks	1	-	1	-	-

regular, two flat, two slightly convex, and four convex. The other use surfaces were located opposite or at right angles to the primary surfaces.

Secondary Use. One was used as a chopper to a moderate extent on the ends and edges, probably in conjunction with the cornbreaker use (Table 5.57).

Comments. Cornbreaker and abrader combinations have been described before but not in the literature reviewed. The definite association with a corn grinding tool kit at 29SJ 627 suggests that these may have been used in breaking up corn kernels.

Type 18: An Unusual Abraded Rock

This specimen was abraded so we thought it should be analyzed, but it was so unlike anything else that it was designated as a type onto itself (Figure 5.18). It was made of a large sandstone flake (Table 5.58), the flat face of which was abraded and the curved, or bulb of percussion face had some grinding and gouging on it. It came from 29SJ 627, Room 7, Fill. The description will be short since it is one of a kind.

It was made of hard fine-grained sandstone with no recognizable previous form. There was no manufacture and the wear was light. The primary use surface was 66 cm². One face was irregular and the other convex. Edge-rounding was slight, striations moderate, and pecks light. It had no seconary use.

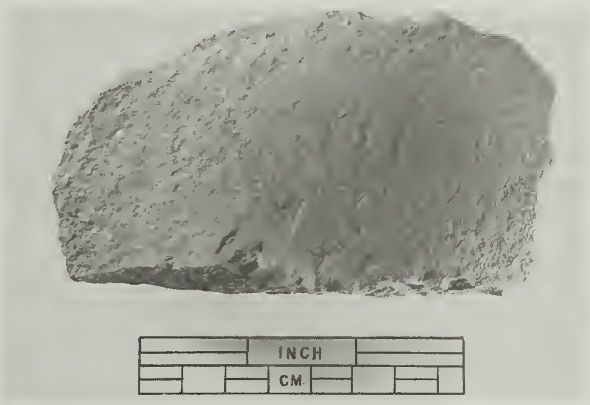


Figure 5.18. An unusual abraded rock from 29SJ 627, Room 17, Level 1 (FS 1716). (NPS Chaco Archive Negative No. 14249C).

Table 5.58. Dimensions of an unusual abraded rock.

Dimension	
Weight	206 g
Length	12 cm
Width	7 cm
Thickness	2 cm

Type 19: Abrader-anvils

Active abrader and anvil use is often found on the same surface of an artifact. This use was not of the incidental sort recorded in the other wear category; for that reason they were treated as a "type" (Figures 5.19 and 5.20). The abrader-anvils differ from the anvil-abraders in that the two kinds of wear are found on the same face in an abrader-anvil and on opposite faces of the anvil-abraders. Sixty-five of these were found (Table 5.59); 57 or 81.7 percent were complete.

Dimensional Variables. Judging from the size range found in abrader-anvils (Tables 5.60 and 5.61), there are probably both one-hand and two-hand varieties represented; a few that are so large that their use as active abraders would have been difficult.

Material and Technology. All of the abrader-anvils were fine or very fine-grained sandstones. A range of sandstones was found, but most were hard or very hard (Table 5.62). The plan view was rectilinear most often, 35 times (53.8 percent), followed by "other" with 18 (27.7 percent), circular with seven (10.8 percent), and unknown five (7.5 percent).

More than half of the abrader-anvils were modified in some manner, suggesting that a specific use was intended. Those with the mano as the previous form were unlikely to have needed further modification (Table 5.62). The amount of work put into the abrader-anvils was none 25 times (38.5 percent), light 13 times (19.5 percent), moderate 25 times (38.5 percent), extensive once (1.5 percent), and unknown once (Table 5.63).

Characteristics of the Use Surface. The degree of primary wear was recorded as light 13 times (20.0 percent), moderate 51 times (78.5 percent), and mixed once (1.5 percent). Single- and double-use surfaces are the most common. A total of 115 use surfaces was recorded for the 65 artifacts, an average of 1.76 per artifact (Table 5.64). The majority of the surface contours were slightly convex or convex (Table 5.64).

The locations of these use surfaces are either opposite or at right angles to the primary surface. Forty are opposite and the other ten were at right angles. Edge-rounding occurs in all but 21.5 percent of the cases and striations are present in almost every case (Table 5.65). These are possibly clues to their use and make them very similar to the passive abrader-anvil group, type 21.

Secondary Use. The abrader-anvils with definite secondary use included one as an anvil, 26 as choppers, and one manolike slab. This use was rated light 17 times, moderate 19 times, and heavy once. This use was almost always at a right angle to the primary use surface, 29 times. In another five instances, this use was on ends and edges; for the remainder, this use occurred once each on the opposite side, at an adjacent non-right angle, and on a corner.

Comments. Abrader-anvils appear to represent a multi-functional group of tools. They occur in any site that has a good sample size and in very similar frequencies, usually about three percent. They were not reported in the literature reviewed.

The dual use suggests a kind of activity that included both shaping and cutting with grinding. This could be anything from wood or bone to the hard materials used in the manufacture of ornaments. Fourteen (21.5 percent) were found in floor-fill or floor associations of rooms, kivas, and work areas.

Passive Abraders

Passive abraders have been described under a variety of terms. Judd described them as the "one which remained stationary as the object being altered was moved back and forth upon it" (1954:119). As stationary stones, passive abraders are usually larger than active abraders and the surface wear is different. An abrader used actively involves the entire surface as the work area. In a passive abrader this can be all or only a portion of the surface. The surface contour tends to be convex to flat in an active abrader and flat to concave in a passive abrader.

Woodbury (1954) calls these tools "grinding slabs," and defines them as any slab on which the concavity appeared to be entirely the result of use with no intentional excavation and as irregular in shape with one or both faces worn smooth. He notes that besides paint preparation they may have served other purposes, since they are relatively unspecialized and suited to grinding or crushing seeds, pottery clay, and other materials. He thinks that throughout the

A

B

Figure 5.19. *Type 19: abrader-anvils. A) An abrader-anvil from 29SJ 389, Room 153, Wall Clearing (FS 252). B) An abrader-anvil from 29SJ 391, Room 83, Fill. Note the cutting and gouging wear (C24 2313). (NPS Chaco Archive Negative Nos. 16081 and 18318).*

Figure 5.20. *Type 19: abrader-anvils. An abrader-anvil from 29SJ 299, Pithouse 6, Southern Rock Fall (FS 282). (NPS Chaco Archive Negative No. 14317B).*

Table 5.59. *Site distribution of abrader-anvils.*

Site Number	No.	%
29SJ 299	1	1.5
29SJ 389	26	40.0
29SJ 391	8	12.3
29SJ 627	14	21.5
29SJ 628	3	4.6
29SJ 629	8	12.3
29SJ 633	4	6.2
29SJ 1360	1	1.5
Totals	65	99.9

Table 5.60. Weights of abraders-anvils.

Weight (g)	No.	%	Summary Statistics	
100-299	4	6.2		
300-499	14	21.5		
500-699	9	13.8		
700-899	9	13.8		
900-1099	6	9.2		
1100-1299	3	4.6		
1300-1499	5	7.7		
1500-1699	3	4.6		
1900+	4	6.2		
Unknown	8	12.3	$\bar{x}$	886.07 g
			sd	637.82 g
Totals	65	99.9	range	127-3400 g

Table 5.61. Dimensions of abrader-anvils.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
5-9	6	9.2		
10-14	38	58.5		
15-19	11	16.9		
20-24	4	6.2		
Unknown	6	9.2	$\bar{x}$	13.44 cm
			sd	3.67 cm
Totals	65	100.0	range	8-24 cm
Width				
5-9	23	35.4		
10-14	36	55.1		
15-19	1	1.5		
20-24	-	-		
Unknown	5	7.7	$\bar{x}$	9.95 cm
			sd	1.94 cm
Totals	65	99.7	range	5-16 cm
Thickness				
1-2	15	23.0		
3-4	38	58.4		
5-6	11	17.0		
7-8	1	1.5	$\bar{x}$	3.46 cm
			sd	1.30 cm
Totals	65	99.9	range	1-8 cm

Table 5.62. *Materials of abrader-anvils.*

Material Type	No.	%
Soft sandstone	3	4.6
Medium sandstone	4	6.2
Hard sandstone	27	41.5
Very hard sandstone	31	47.7
Totals	65	100.0
Previous Form		
None	17	26.2
Mano	29	44.6
Metate	2	3.1
Other	2	3.1
Unknown	5	23.1
Totals	65	100.1

Table 5.63. *Manufacture of abrader-anvils.*

Type of Manufacture	No.	%
None	25	38.5
Flaked	20	30.8
Pecked	1	1.5
Flaked and abraded	5	7.7
Pecked and flaked	4	6.2
Pecked and abraded	4	6.2
Pecked, flaked and abraded	5	7.7
Unknown	1	1.5
Totals	65	100.1

Table 5.64. *Characteristics of the primary use surface of abrader-anvils.*

Area (cm^2)	No.	%	Summary Statistics
1-19	1	1.5	
20-39	4	6.2	
40-59	11	16.9	
60-79	16	24.6	
80-99	7	10.8	
100-119	9	13.8	
120-139	4	6.2	
140-159	1	1.5	
160-179	2	3.1	
180-200	2	3.1	
Unknown	8	12.3	$\bar{x}$ 83.39 cm^2
Totals	65	100.0	sd 39.68 cm^2 range 16-200 cm^2
Use Surface	Occurrences	%	
1	25	38.5	
2	34	52.3	
3	4	6.2	
4	1	1.5	
6	1	1.5	
Totals	65	100.0	
Surface Contour			
Irregular	6	5.2	
Flat	41	35.6	
Slightly concave	5	4.3	
Concave	2	1.7	
Slightly convex	45	39.1	
Convex	16	13.9	
Totals	115	99.8	

Table 5.65. Other characteristics of primary use surface of abrader-anvils.

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	14	36	15	-	-
Cutting/gouging	-	-	-	-	65
Grinding/polish	-	-	-	-	65
Striations	3	21	41	-	-
Pecks[a]	44	1	5	-	4
Staining	55	4	2	4	-

[a] Eleven had pecking that was characteristic of previous use and do not appear in this table.

Southwest the most frequent use seemed to be paint grinding. Hayes (1975) calls these tools "whetstones or stationary stones," and notes that they may have been used to sharpen the edges of small tools.

For sites in Chaco Canyon, Vivian and Mathews (1965) do not separate the active and passive abraders in their counts, but they do picture both passive abraders and passive lapidary abraders. Brand et al. (1937) report a small rectangular slab or disk palette for Bc 50, Kluckhohn and Reiter (1939) note several sandstone slabs and lapidary tools for Bc 51, and Dutton (1938) reports lapidary stones and rasps which are probably similar to the passive abraders described here.

Rather than treating passive abraders as a group of tools, the normal archeological consideration has been to individually describe only the nicer examples such as lapstones or sandal lasts. Table 5.66 is a summary table which compares the dimensional variables of all the groups of passive abraders.

Type 20: Passive Abraders

Undifferentiated passive abraders comprise the second largest group of abraders analyzed. Two hundred and ninety-four were analyzed, 293 will be used in this description. Only 130 or 44.4 percent of these were complete (Figures 5.21-5.23). Table 5.67 provides counts by site.

The artifacts called lapstones and sandal lasts are submerged in this group of abraders. These do not necessarily differ from the other passive abraders in terms of use; but because they are often extensively modified and nice to look at they are the most frequently noted passive abraders in the literature.

Dimensional Variables. As expected there is a great deal of variability in weight and size, from small hand-held tools to immobile objects (Tables 5.68 and 5.69).

Material and Technology. A variety of sandstone was used in passive abraders (Table 5.70). The grain size was fine or very fine except for one instance of a medium-grained sandstone. Shapes were most often other, irregular, or unknown.

Definite previous forms were uncommon and varied. One hundred and seventy-one definitely did not have previous uses (58.4 percent). The most common were slab covers (16 or 5.5 percent) and metates (11 or 3.8 percent). Concretion, river cobble, and mano had one each and three were recorded as "other." The remaining 89 (30.4 percent) were unknown.

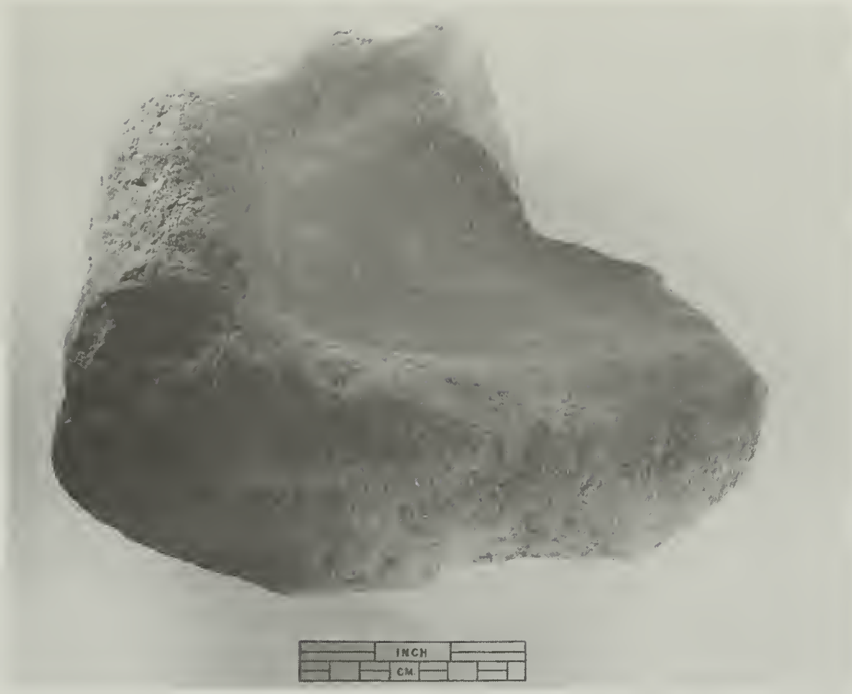
Less than half were modified with diverse combinations of manufacture (Table 5.71). This was rated slight 48 times, moderate 55 times, and extensive 24 times. The extensive modification most likely represents the lapstones and sandal lasts.

Characteristics of the Use Surface. Slight or moderate is the most common assessment of the amount of wear (Table 5.72). Intensive use was necessary to wear a depression in the harder sandstones; none were worn through or even close to it. Surface areas of less than 100 cm^2 appear to be the most common (Table 5.72); however, the smaller artifacts were probably more likely to remain intact, resulting in a biased view of the area of the use surface. Single- and double-use surfaces again account for most of the sample (Table 5.72). A total of 482 use surfaces were recorded, an average of 1.6 per passive abrader.

Table 5.66. Passive abraders.

Measure	Type 20	21/51	22	24	25	26	27	28	29
Number	293	81	118	3	2	10	1	24	1
Number complete	130	65	60	1	2	3	0	19	1
Percent complete	44.4	80.2	50.8	33.3	100.0	33.3	0	79.2	100.0
Mean weight	1433.9	3429.9	585.4	8400.0	3236.0	1410.7	-	430.7	1197.0
Mean length	15.9	22.0	14.2	33.0	22.5	18.0	-	11.1	14.0
Mean width	12.2	16.6	9.2	14.0	10.0	14.2	20.0	8.0	12.0
Mean thickness	2.6	4.2	1.4	7.3	9.5	2.4	4.0	1.9	5.0
Mean surface area	111.4	268.2	98.4	75.0	32.5	188.7	-	47.1	75.0

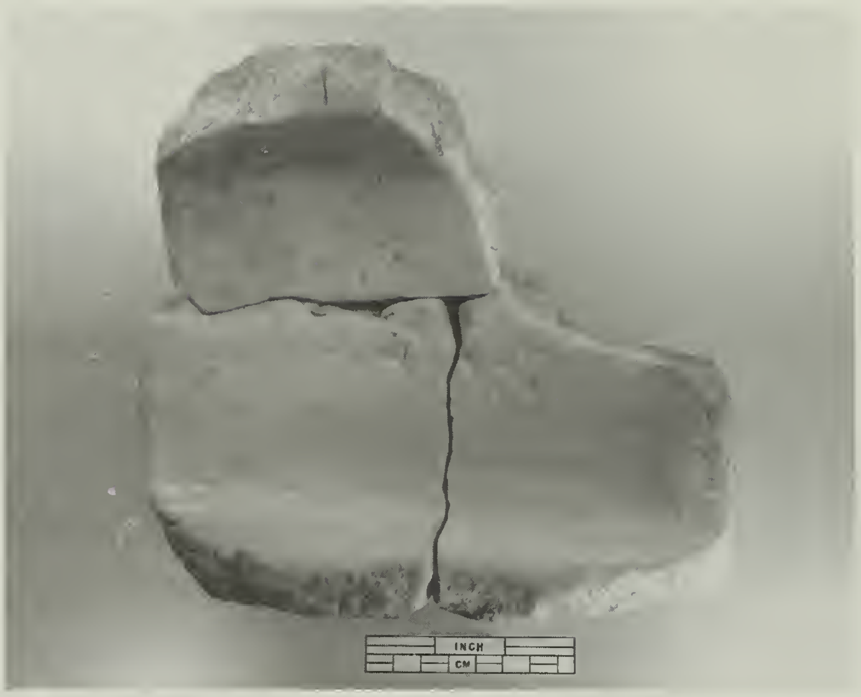
20 = Undifferentiated passive abraders.
21/51 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Whetstone.
25 = Mortars.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Mortar-palette.



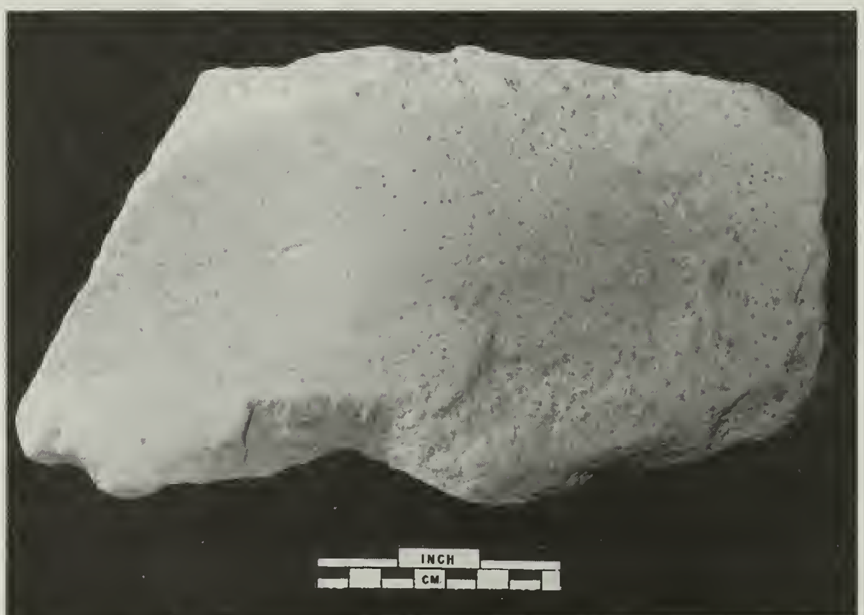
A

B

Figure 5.21. *Type 20: undifferentiated passive abraders. A) A soft sandstone passive abrader from 29SJ 423, Great Kiva, Roof fall (FS 181). B) A passive abrader from 29SJ 1360, Kiva B, Masonry Wall (FS 809). (NPS Chaco Archive Negative Nos. 14288A and 14300B).*

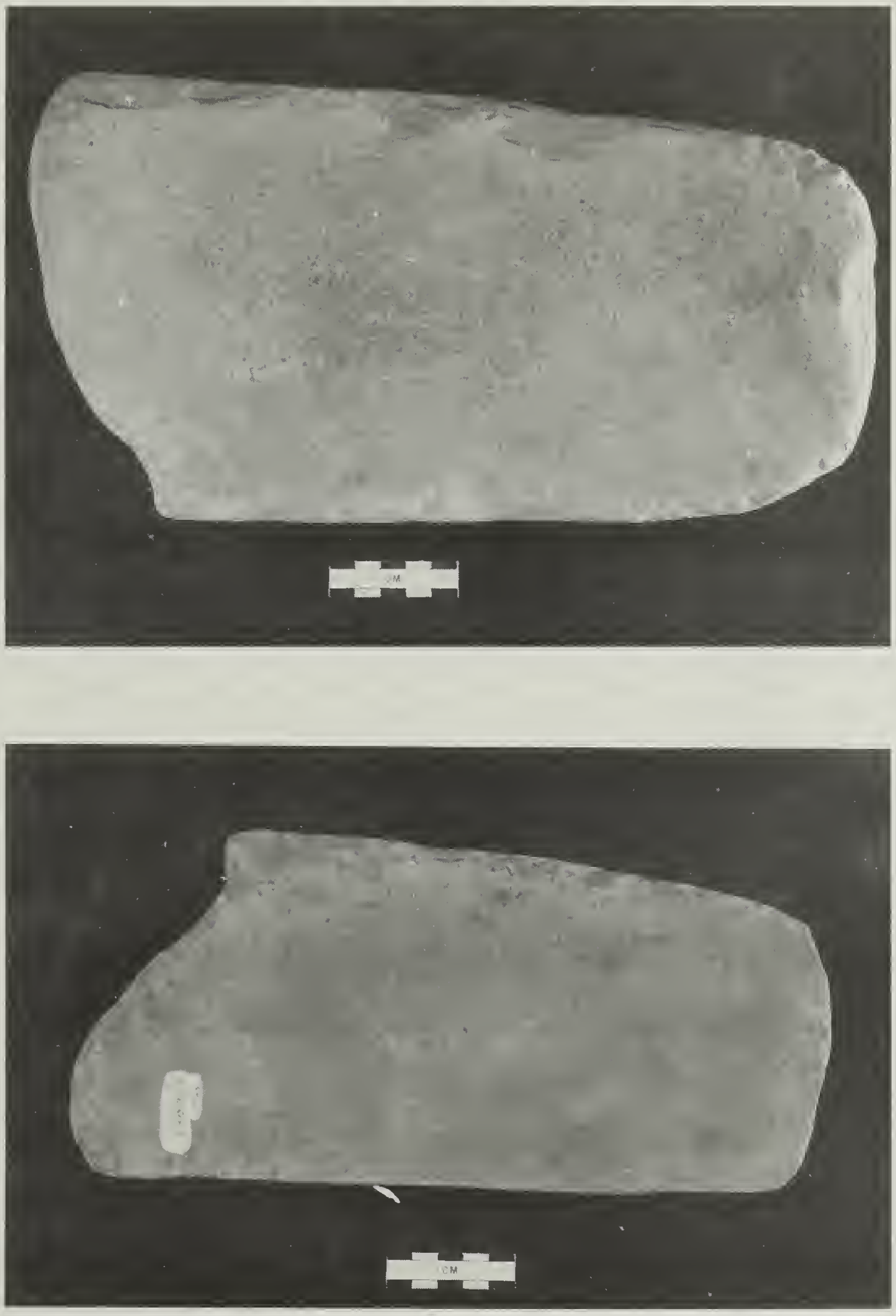


A



B

Figure 5.22. *Type 20: undifferentiated passive abraders. A) A metate-shaped, soft sandstone, passive abrader from 29SJ 628, Pithouse C, Level 1 (FS 132). B) Another soft sandstone, passive abrader from 29SJ 389, Room 103, Floor Fill (FS 1137). (NPS Chaco Archive Negative Nos. 14292B and 16061B).*



A

B

Figure 5.23. *Type 20: undifferentiated passive abraders. A) A sandal last from 29SJ 391, Room 21, Floor Fill. Note the deep scratches and other indications of use (C2105). B) Another sandal last from 29SJ 391, Room 83, Refuse Fill (C2165). (NPS Chaco Archive Negative Nos. 18295 and 18296).*

Table 5.67. Site distribution of passive abraders.

Site Number	No.	%
29SJ 299	3	1.0
29SJ 389	194	66.2
29SJ 391	14	4.8
29SJ 423	5	1.7
29SJ 627	25	8.5
29SJ 628	10	3.4
29SJ 629	31	10.6
29SJ 633	5	1.7
29SJ 724	4	1.4
29SJ 1360	2	0.7
Totals	293	100.0

Table 5.68. Weights of passive abraders.

Weight (g)	No.	%	Summary Statistics	
1-499	57	19.4		
500-999	31	10.6		
1000-1499	11	3.8		
1500-1999	6	2.1		
2000-2499	7	2.3		
2500-2999	6	2.0		
3000-3999	3	1.0		
4000-4999	3	1.0		
5000-5999	1	0.3		
8000-8999	1	0.3		
10000+	3	1.0		
Unknown	164	55.8	$\bar{x}$	1433.90 g
			sd	3090.69 g
Totals	293	99.6	range	33-28,380 g

Table 5.69. Dimensions of passive abraders.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
4-9	26	8.8		
10-19	79	26.9		
20-29	31	10.5		
30-39	3	1.0		
40-49	2	0.7		
50-59	1	0.3		
Unknown	151	51.3	$\bar{x}$	15.92 cm
			sd	7.68 cm
Totals	293	99.5	range	4-51 cm
Width				
1-4	2	0.7		
5-9	62	21.1		
10-14	73	24.8		
15-19	23	7.8		
20-24	14	4.8		
25-29	3	1.0		
30-34	3	1.0		
Unknown	113	38.4	$\bar{x}$	12.17 cm
			sd	5.54 cm
Totals	293	99.6	range	1-34 cm
Thickness				
1-2	180	61.4		
3-4	72	24.6		
5-6	19	6.5		
7-8	9	3.1		
9-10	3	1.0		
11-12	1	0.3		
13-14	1	0.3		
15-16	1	0.3		
Unknown	7	2.4	$\bar{x}$	2.57 cm
			sd	2.03 cm
Totals	293	99.9	range	1-15 cm

Table 5.70. Materials and shapes of passive abraders.

Material	No.	%
Soft sandstone	40	13.7
Medium sandstone	28	9.6
Hard sandstone	117	39.9
Very hard sandstone	108	36.9
Totals	293	100.1
Shape		
Rectilinear	68	23.2
Circular	8	2.7
Other	100	34.1
Unknown	117	39.9
Totals	293	99.9

Table 5.71. Manufacture of passive abraders.

Type of Manufacture	No.	%
None	122	41.6
Flaked	67	22.9
Abraded	12	4.1
Pecked	3	1.0
Flaked and abraded	33	11.3
Pecked and flaked	10	3.4
Pecked and abraded	1	0.3
Flaked, pecked and abraded	3	1.0
Unknown	42	14.3
Totals	293	99.9

Table 5.72. Characteristics of the primary use surface of passive abraders.

Degree of Primary wear	No.	%	Summary Statistics	
Light	128	43.7		
Medium	160	54.6		
Heavy	3	1.0		
Mixed	1	0.3		
Unknown	1	0.3		
Totals	293	99.9		
Area (cm^2)				
1-49	45	15.4		
50-99	41	14.0		
100-149	18	6.1		
150-199	10	3.4		
200-249	11	3.8		
250-299	5	1.7		
300-349	1	0.3		
350-399	2	0.7		
400-499	2	0.7		
600-699	1	0.3		
700-799	1	0.3		
Unknown	156	53.2	$\bar{x}$	111.42 cm^2
			sd	111.66 cm^2
Totals	293	99.9	range	6-700 cm^2
Surface	Occurrences			
1	178	60.8		
2	73	24.9		
3	19	6.5		
4	13	4.4		
5	7	2.4		
6	1	0.3		
9	1	0.3		
Unknown	1	0.3		
Totals	293	99.9		

Table 5.73. Other characteristics of primary use surfaces of passive abraders.

	All Surfaces		Single Surface Only	
Surface Contour	No.	%	No.	%
Irregular	35	7.3	20	11.2
Flat	96	19.9	16	9.0
Slightly concave	183	38.0	100	56.1
Concave	79	16.3	35	19.7
Slightly convex	35	7.3	6	3.3
Convex	54	11.2	1	0.5
Totals	482	100.0	178	99.8

Location	Opposite or Angled	Adjacent Non-right	Adjacent Right	Same Plane Parallel	Same Plane Random	Frequency
	-	-	-	-	-	180
	-	-	-	-	4	1
	-	-	-	1	-	5
	-	-	-	2	-	2
	-	-	1	-	-	4
	-	-	4	1	-	1
	-	1	-	-	-	1
	1	-	-	-	-	61
	1	-	-	-	1	1
	1	-	-	1	-	1
	1	-	1	-	-	15
	1	-	2	-	-	9
	1	-	3	-	-	2
	1	1	-	-	-	1
	1	1	1	-	-	2
	1	1	2	-	-	2
	1	2	-	-	-	1
	1	2	1	-	-	1
	2	-	-	2	-	1
	3	-	2	4	-	1
	3	1	-	1	-	1
Occurrence:	103	11	56	18	5	293

Table 5.74. Types of use on passive abraders.

Primary Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	159	101	33	-	-
Cutting/gouging	217	60	13	3	-
Grinding/polish	-	-	-	-	293
Striations	48	74	167	4	-
Pecks	276	12	5	-	-
Staining	244	27	16	6	-
Other	288	1	3	1	-

Secondary Use	No.	%
None	71	24.2
Active abrader	1	0.3
Grooved abrader	2	0.7
Hammerstone	6	2.0
Chopper	55	18.8
Manolike slab	2	0.7
Architectural stone	2	0.7
Unknown	154	52.6
Totals	293	99.6

Slightly concave is the most characteristic surface contour for the passive abraders (Table 5.73). Only a few are actually concave. The rest are representative of the stages of wear working up to a passive abrader. Opposite use surfaces were found on 35.1 percent of the passive abraders, almost as frequently as single surface artifacts. There was a variety of other surface configurations (Table 5.73). Any kind of wear can be found on a passive abrader (Table 5.74). It appears as though none were without at least one kind of other wear. As common household utensils they were likely to be used for anything at all.

Secondary Use. Only one-quarter of the passive abraders had a recognizable secondary use, and those were quite variable (Table 5.74). Secondary chopper use was common among all abrader types. Of those reused, 48 were lightly used, 21 were moderately used, and one was heavily used. Two were located opposite the primary use surface, one at an adjacent non-right angle, 58 at right angles, five on corners, and four utilized the whole artifact.

Comments. As indicated by the illustrations of undifferentiated passive abraders (Figures 5.21-5.23), this is quite a diverse type. Nearly every Southwestern site report contains some reference to a tool that would fall into this category. Woodbury (1954) describes small "metate-like" stones, Pepper (1920) refers to sandstone tablets, Rohn (1971) to stone tablets, Judd (1954) to sandstone tablets, and Bradley (1971) to "miniature metates" with troughs and also to "flat miniature metates."

Earl Morris mentioned "polished slabs" from Aztec Ruin (Morris 1919), and lapstones and sandal forms from the La Plata District (Morris 1939). Hayes (1975) described the lapstones from Badger House as large discoidal cobbles. Rohn made an interesting observation about an extensively ground stone tablet from Mug House. "When this tablet is supported horizontally on the tips of the fingers and struck with a stone, stick or a bone, it produces a clear bell-like sound" (Rohn 1971:241). All of those found at Mug House were in association with kivas.

Pepper (1920) and Judd (1954) both described stone tablets from Pueblo Bonito. Judd even noted that they came from all parts of the site. One, "a cream-colored marlaceous shale foreign to Chaco," was from a kiva. Bc 51 was reported to have ten well-shaped and polished sandstone slabs (Brand et al. 1937).

Sandal lasts appear to have been relatively uncommon in Chaco Canyon. Una Vida contained two, Bc 50 one, and Judd (1954) reported seven fine-grained sandstone lasts from Pueblo Bonito. The variety of materials, sizes, shapes and wear suggest a number of uses for the artifacts lumped into the undifferentiated passive abrader type.

Types 21 and 51: Passive Abrader-anvil Combinations

These two groups are so close in their attributes that they were lumped together for descriptions and the site tables. All are characterized by a depression, edge-rounding, and some anvil use (Figures 5.24-5.26). See the previous section on abrader-anvils for a description of characteristic anvil wear. Ideally, they were assigned to Type 21 if the passive abrader wear seemed greater and Type 51 if the anvil wear were greater. The choice, however, was often difficult and not always consistent. Their functions were probably identical. Eighty-one of these were recovered; 65 or 80.2 percent were complete. Table 5.75 indicates their site distribution.

Table 5.75. Site distribution of passive abrader-anvils.

Site Number	No.	%
29SJ 299	7	8.6
29SJ 389	15	18.5
29SJ 391	1	1.2
29SJ 423	1	1.2
29SJ 627	30	37.0
29SJ 628	5	6.2
29SJ 629	9	11.1
29SJ 633	7	8.6
29SJ 724	2	2.5
29SJ 1360	4	4.9
Totals	81	99.8

Dimensional Variables. For a group of abraders with such similar characteristics there is a wide range of weights and sizes represented (Tables 5.76 and 5.77).

Material and Technology. Hard or very hard fine-grained sandstone was generally used but other materials were found (Table 5.78). The plan view or shape was most often rectilinear or other-shaped, rectilinear 34 (42.0 percent), and other 33 (40.7 percent). Four were circular (4.9 percent), and ten were unknown (12.3 percent). Several previous forms were discerned (Table 5.78). Most had some manufacture. A total of 54 had some flaking, 39 had some abrading, and 20 had pecking. The amount of manufacture was slight 17 times and moderate 43 times.

Characteristics of the Use Surface. The amount of primary wear was generally moderate, 67 times or 82.7 percent. Nine were lightly used (11.1 percent), three were heavily used (3.7 percent) and two were unknown (2.5 percent). Again there is a lot of variation in the area of the use surface, as shown by the large standard deviation (Table 5.79). This would seem to indicate that although they might have been a standard tool type, they were not a standardized one. The number of use surfaces ranged from one to five for a total of 147 surfaces or 1.8 per artifact (Table 5.79). Almost all were single- or double-faced.

As expected, the most common surface contours were concave and slightly concave (Table 5.80). When these had multiple surfaces, the other use surfaces recorded were not always passive abrader surfaces. This was especially true of the irregular, convex and slightly convex surfaces which rarely occur in the single-faced passive abrader-anvils. Opposites comprise almost all of the other use surfaces (Table 5.80). The edges have very little wear compared to most other abrader types. Combining the two groups gives the array of uses found in Table 5.80. Grinding/polish is not necessarily characteristic of anvils, and cutting/gouging is not necessarily a characteristic of passive abraders.

Secondary Use. Secondary use was not common. Eighteen or 22.2 percent had recognizable chopper use, and one had a mano blank-corn crusher secondary use. The use was rated light seven times, moderate 11 times, and heavy once. The location of this use was on adjacent right-angle faces for all but one which was an adjacent non-right-angle face.

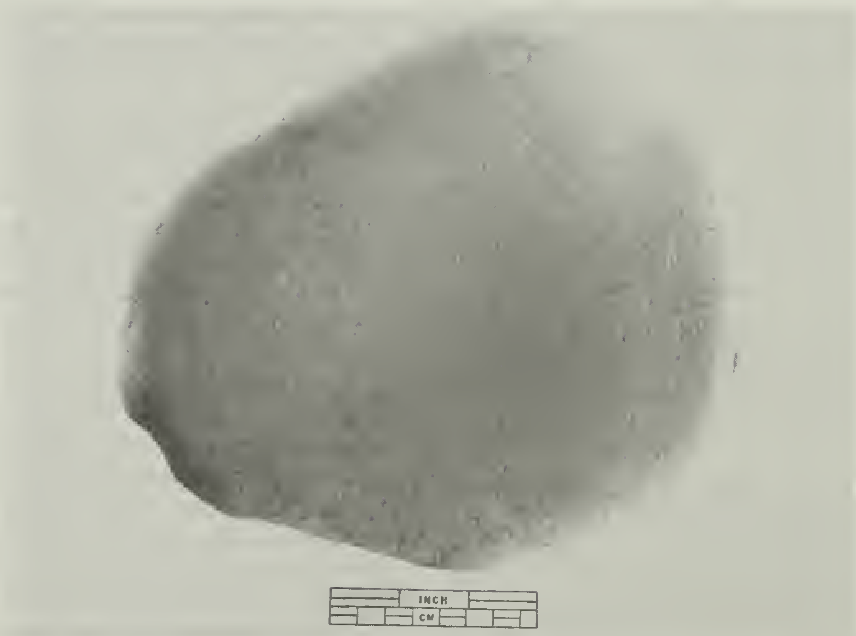
Comments. Passive abrader-anvils are not commonly reported. Rohn (1971) described a similar object stating that experiments have shown that they made good surfaces for removing pulp from yucca, an action he felt would account for the smooth, very slick surface with rounded edges and the polished, slightly concavo-convex surfaces.

Twenty-two of those in our sample were found in floor association proveniences from rooms to kivas to plazas in Basketmaker III through Pueblo III sites, suggesting use in diverse settings and throughout all time periods.

Type 22: Passive Lapidary Abraders

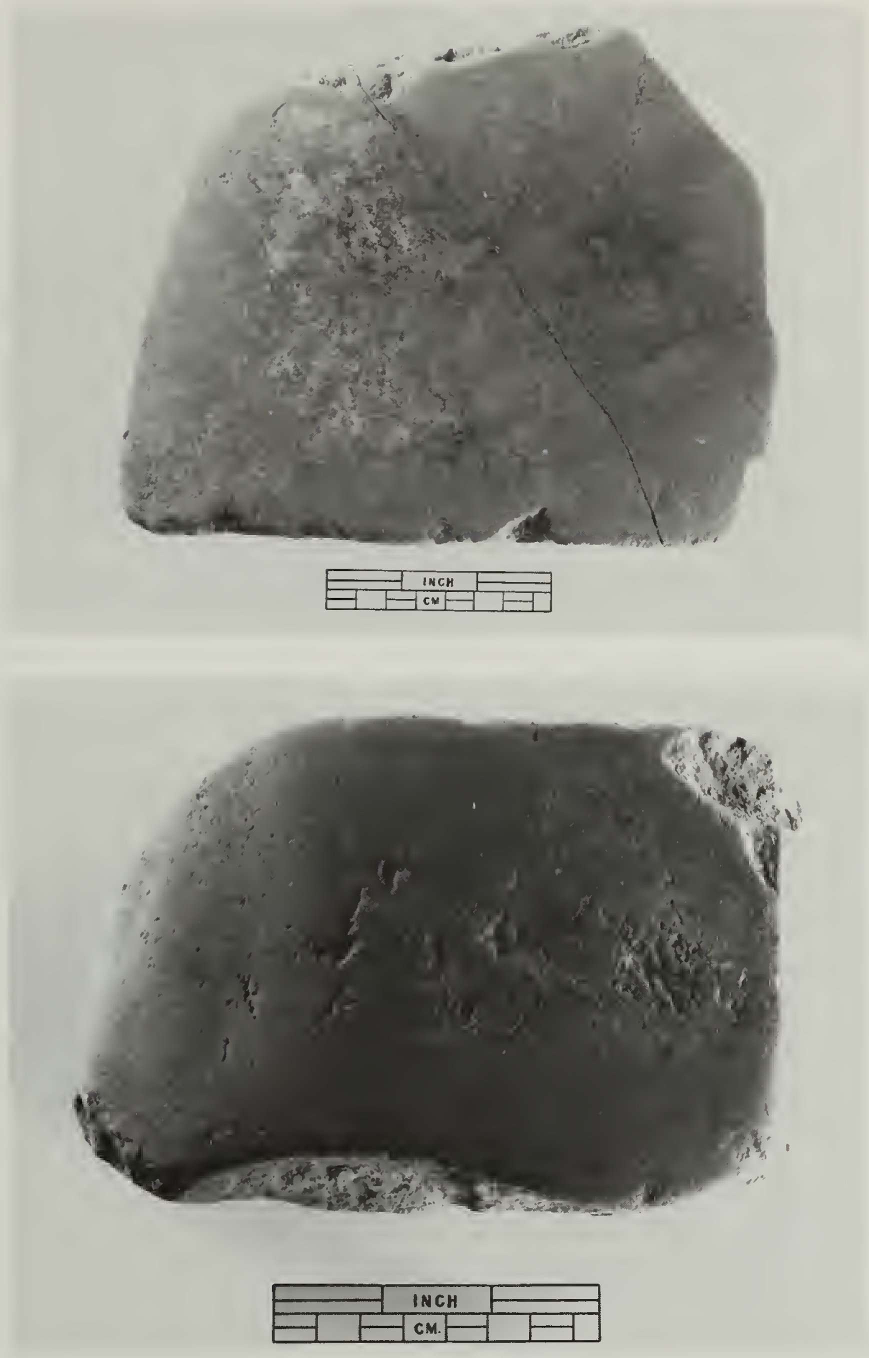
The treatment of the passive lapidary abraders will be slightly different from the other types. A large number came from site 29SJ 629 (Table 5.81)

A



B

Figure 5.24. *Types 21 and 51: passive abrader-anvils and anvil-passive abraders. A) A soft sandstone, passive abrader anvil from 29SJ 299, Pithouse B, Stratum A (FS 281). B) A passive abrader-anvil from 29SJ 628, Pithouse C, Antechamber, Fill (FS 649). (NPS Chaco Archive Negative Nos. 14296B and 14285C).*



A

B

Figure 5.25. *Types 21 and 51: passive abrader-anvil and anvil-passive abrader combinations. A) A passive abrader-anvil with little anvil wear from 29SJ 1360, Area 1, Surface 2 (FS 190). B) A passive abrader-anvil with heavy anvil wear from 29SJ 1360, Area 1 (FS 191). (NPS Chaco Archive Negative Nos. 14248A and 14233C).*

A

B

Figure 5.26. *Types 21 and 51: passive abrader-anvil and anvil-passive abrader combination. A) A passive abrader-anvil from 29SJ 627, Kiva C, Vent Shaft, Fill (FS 4355). Note the basin-shaped depression, anvil wear and many fine scratches. B) A passive abrader-anvil from 29SJ 627, Kiva D, Floor 1, Contact (FS 5176). (NPS Chaco Archive Negative No. 14301B and 14289A).*

Table 5.76. Weights of passive abrader-anvils.

Weight (g)	No.	%	Summary Statistics	
1-999	11	13.6		
1000-1999	18	22.1		
2000-2999	16	19.8		
3000-3999	7	8.6		
4000-4999	6	7.4		
5000-5999	3	3.7		
9000+	5	6.1		
Unknown	15	18.5	$\bar{x}$	3429.89 g
			sd	5047.25 g
Totals	81	99.8	range	47-33,566 g

Table 5.77. Dimensions of passive abrader-anvils.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
5-9	1	1.2		
10-14	8	9.9		
15-19	17	21.0		
20-24	18	22.2		
25-29	11	13.6		
30-34	9	11.1		
35-39	1	1.2		
40-44	1	1.2		
45-49	1	1.2		
Unknown	14	17.3	$\bar{x}$	22.04 cm
			sd	7.57 cm
Totals	81	99.9	range	6-46 cm
Width				
5-9	2	2.5		
10-14	22	27.2		
15-19	32	39.5		
20-24	9	11.1		
25-29	5	6.2		
30-34	-	-		
35-39	1	1.2		
40-44	-	-		
45-49	-	-		
Unknown	10	12.3	$\bar{x}$	16.61 cm
			sd	5.24 cm
Totals	81	100.0	range	5-36 cm
Thickness				
1-2	19	23.5		
3-4	32	39.5		
5-6	21	25.9		
7-8	4	4.9		
9-10	2	2.5		
13-14	1	1.2		
17-18	1	1.2		
Unknown	1	1.2	$\bar{x}$	4.17 cm
			sd	2.64 cm
Totals	81	99.9	range	1-18 cm

Table 5.78. Materials and previous forms of passive abrader-anvils.

Material	No.	%
Soft sandstone	7	8.6
Medium sandstone	11	13.6
Hard sandstone	36	44.4
Very hard sandstone	25	30.9
Siltstone	2	2.5
Totals	81	100.0
Previous Form		
None	43	53.1
Mano	2	2.5
Metate	12	14.8
Slab cover	7	8.6
Anvil	3	3.7
Other	1	1.2
Unknown	13	16.0
Totals	81	99.9

Table 5.79. Characteristics of the primary use surface of passive abrader-anvils.

Area (cm^2)	No.	%	Summary Statistics	
1-99	10	12.3		
100-199	21	25.9		
200-299	17	21.0		
300-399	9	11.1		
400-499	5	6.2		
500-599	3	3.7		
700-799	1	1.2		
2400	1	1.2		
Unknown	14	17.3	$\bar{x}$	268.19 cm^2
			sd	301.31 cm^2
Totals	81	99.9	range	32-2,400 cm^2
Use Surface	Occurrences	%		
1	29	35.8		
2	42	51.9		
3	7	8.6		
4	2	2.5		
5	1	1.2		
Totals	81	100.0		

Table 5.80. Other characteristics of primary use surfaces of passive abrader-anvils.

	All Passive Abrader-Anvils		Single Surface Only	
Surface Contour	No.	%	No.	%
Irregular	16	10.9	1	3.4
Flat	14	9.5	2	6.9
Slightly concave	44	29.9	15	51.7
Concave	55	37.4	10	34.4
Slightly convex	10	6.8	1	3.4
Convex	8	5.4	-	-
Totals	147	99.9	29	99.8

Locations	Opposite or angled	Adjacent non-right	Adjacent right	Same plane parallel	Same plane random	Frequency
	-	-	-	-	-	34
	-	-	-	-	3	1
	-	-	-	1	-	1
	-	-	-	2	1	1
	1	-	-	-	1	40
	1	1	-	1	-	1
	1	-	1	-	-	1
	2	-	-	-	-	2
Occurrence:	46	1	1	4	4	-

Use	Absent	Light	Moderate	Heavy	Characteristic
Edge-rounding	15	27	33	6	-
Cutting/gouging	12	10	6	-	53
Grinding/polish	-	-	2	79	-
Striations	8	34	39	-	-
Pecked	37	4	5	-	35
Staining	57	12	7	5	-

Table 5.81. Site distribution of passive lapidary abraders.

Site Number	No.	%
29SJ 389	5	4.2
29SJ 391	1	0.8
29SJ 627	22	18.6
29SJ 629	83	70.3
29SJ 633	2	1.7
29SJ 1360	4	3.4
29SJ 1659	1	0.8
Totals	118	99.8

and are distinctive. The total will be compared to those from 29SJ 629 and those from the other sites to document the differences.

This group was originally defined by looking at examples of stones thought to be lapidary stones (Judd 1954) and Vivian and Mathews (1965). Some passive abraders similar to lapstones do have wear that could be considered lapidary and have been placed in this type (Figures 5.27-5.31).

Dimensional Variables. The weight and dimensional tables (Tables 5.82 and 5.83) illustrate that 29SJ 629 does contribute heavily to the small passive lapidary abrader sample. Those from the other sites are more representative of a habitation site assemblage. 29SJ 629 may have been inhabited by a group of craft specialists during part of its occupation (Windes 1993). Therefore, the lapidary tool kit should differ from that at other sites where the manufacture of turquoise ornaments was occasional or for personal use.

Materials and Technology. The sandstone was all fine or very fine-grained. The distribution of materials is not very different between the groups (Table 5.84). 29SJ 629 does have soft and medium sandstones not found elsewhere. The siltstone and limestone are from 29SJ 627.

In general, there is a tendency towards other- and rectilinear-shaped tools, although the rectilinear tools are much more characteristic of sites other than 29SJ 629 (Table 5.84). The number of previous forms (Table 5.84) for passive lapidary abraders is quite low. This suggests a specialized use for which certain characteristics of the stone were selected.

The manufacture does distinguish these groups (Table 5.85). The 29SJ 629 passive lapidary abraders have less manufacture and it is generally light modification. Although a specialized tool kit was required, there was not a lot of labor invested in the manufacture of those tools.

Surface Characteristics. Only three abraders from the other sites were close to the majority of those from 29SJ 629 in surface area. The small area of the use surfaces is not common to most other sites (Table 5.86). It may be that items of more or less standardized sizes suggest craft specialization.

The 29SJ 629 group has a lower percentage of single- and double-faced abraders with a trend toward many-surfaced tools (Table 5.86). There was an average of 2.98 surfaces per artifact for both groups, 3.3 for 29SJ 629, and 2.2 for the other sites.

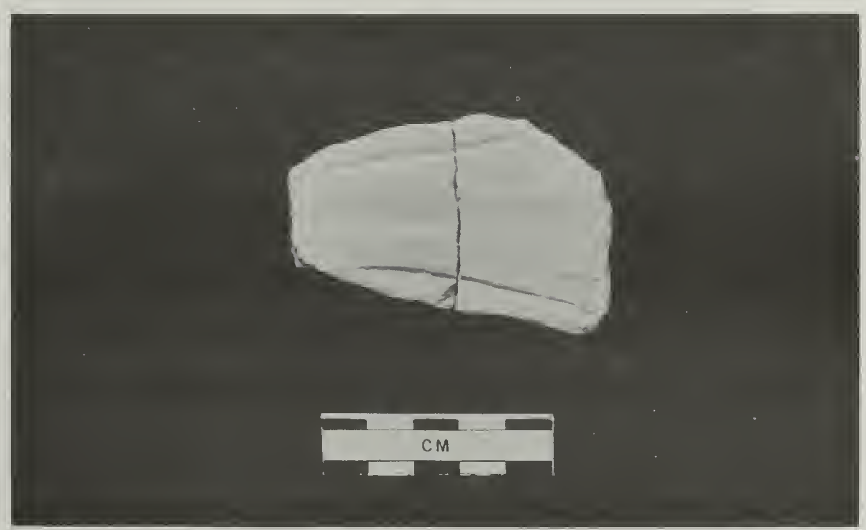
Edge-rounding occurs on 77.1 percent of the passive lapidary abraders from 29SJ 629 and 57.1 percent of those from the other sites; this was light or moderate for all. Cutting and gouging were rare in both groups, 4.8 percent of 29SJ 629 and 34.3 percent of the other sites. The larger percentage from the other site group is probably due to the overall larger size of the abraders in that sample. All were ground and very few were not striated, 3.6 percent of 29SJ 629 and 5.7 percent of the other sites. Again, these are mostly light or moderate but one from 29SJ 629 and four from the other sites were heavily striated. Pecks were rare at 29SJ 629, 1.2 percent, but 34.3 percent at the other sites, again, probably due to the larger sizes. 29SJ 629 had staining on 20.5 percent and the other sites had 31.4 percent. Table 5.87 presents contour types and a summary of surface locations.

Secondary Use. Because so many abraders from 29SJ 629 were small, secondary use was infrequent (Table 5.88). Of these, ten (45.5 percent) from 29SJ 629 and two (30.0 percent) from the other sites had secondary use that was rated light; 12 (54.6 percent) from 29SJ 629, and three (50.0 percent) of those from the other sites were moderate. One from the other sites was recorded as heavy. All of the secondary wear was at an adjacent right angle to the primary use surface for 29SJ 629, as was most of that for the other sites, (80.0 percent). One "other" was on the same plane and another utilized the whole artifact.

Comments. When compared to the passive lapidary abraders from the other sites, those from 29SJ 629 are a more uniform group, especially in the utilized surface area. Because they are numerous and are so similar, it is reasonable to suggest that the small abraders (as in Figure 5.27) were the result of craft specialization. Exactly how these were used is difficult to ascertain; perhaps the grooves were used for rounding or for shaping beads and the edges of pendants or mosaics.

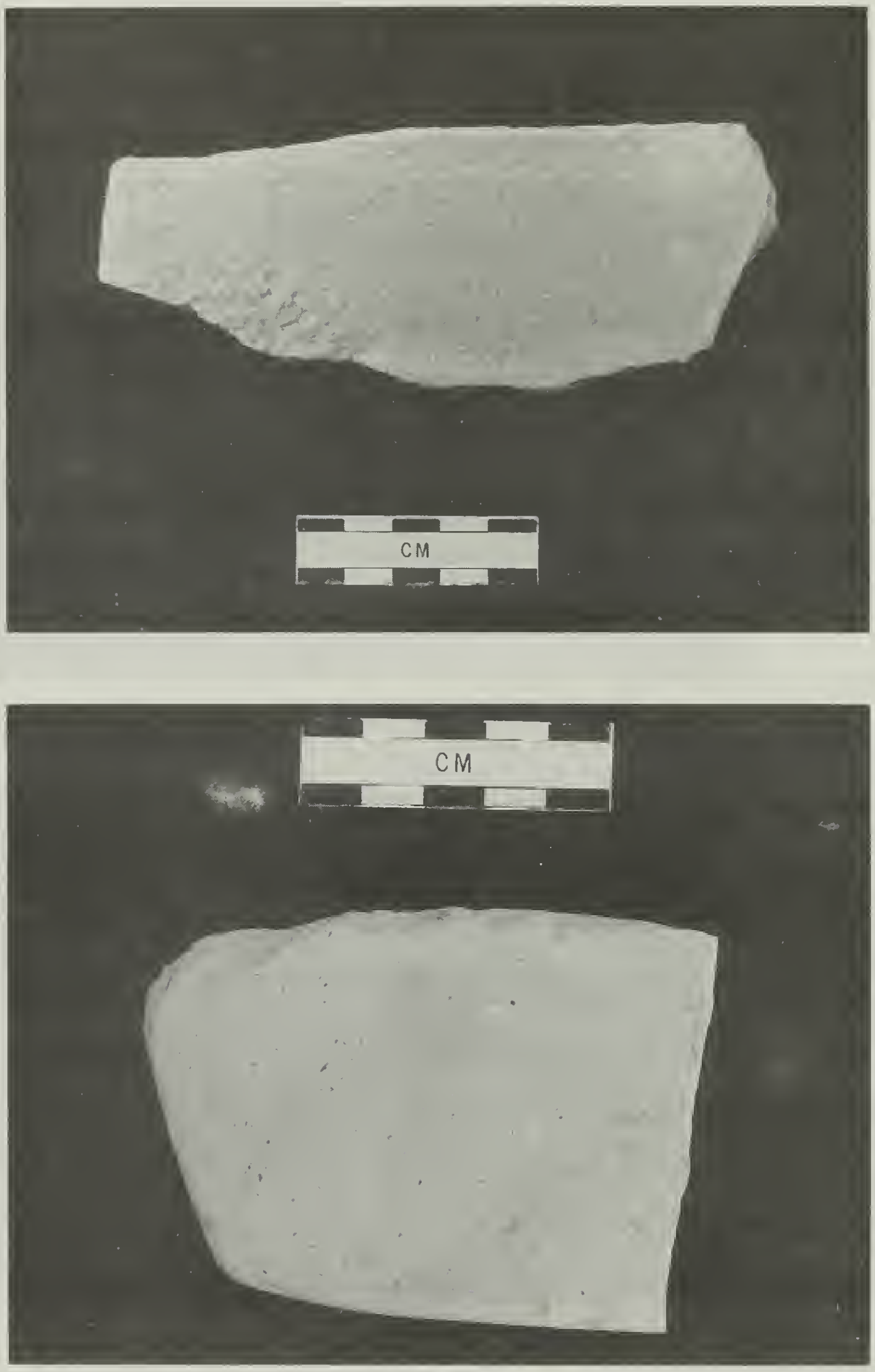
"Lapidary abraders" are reported mainly from sites in Chaco Canyon. This is most likely due to the archeologists' failure to distinguish them during excavation or analysis rather than their absence at other sites. The small variety found at 29SJ 629 is quite nondescript and could easily be missed, while the large variety is undoubtedly lumped with other passive abraders. For sites in Chaco Canyon, they

A



B

Figure 5.27. *Type 22: passive lapidary abraders. A) A small passive lapidary abrader from 29SJ 629, Plaza Grid 16, Level 2 (SF 2437). B) Another small passive lapidary abrader from 29SJ 629, Plaza, Other Pit 1, Fill (FS 2154). (NPS Chaco Archive Negative Nos. 14336A and 14188B).*



A

B

Figure 5.28. *Type 22: passive lapidary abraders. A) A small passive lapidary abrader from 29SJ 629, Plaza, Other Pit 6 (FS 1978). B) Another small passive lapidary abrader from 29SJ 389, Trash Mound, Grid 53, Layer 58 (FS 4799). (NPS Chaco Archive Negative Nos. 14191A and 18256B).*

A

B

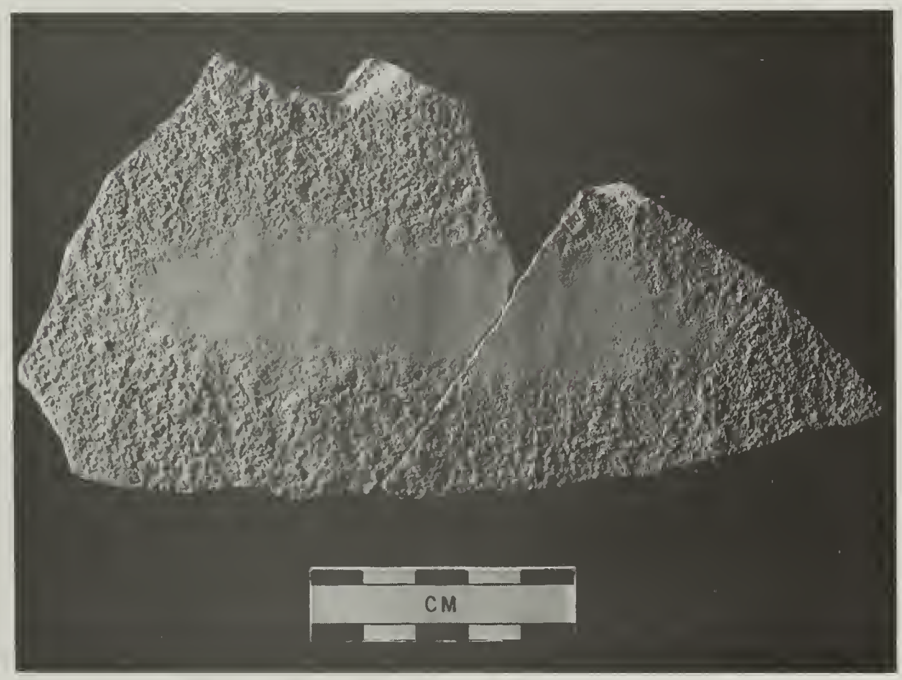
Figure 5.29. *Type 22: passive lapidary abraders. A) A passive lapidary abrader from 29SJ 627, Kiva D, Floor Contact (FS 5182). B) A passive lapidary abrader from 29SJ 1360, Kiva B, Floor Contact (FS 682). (NPS Chaco Archive Negative Nos. 14271A and 14308A).*

A

B

Figure 5.30. *Type 22: passive lapidary abraders. A) A passive lapidary abrader from 29SJ 1360, Kiva B, Floor Contact (FS 687). B) A passive lapidary abrader from 29SJ 1360, Kiva B, Floor Contact (FS 686). (NPS Chaco Archive Negative Nos. 14306A and 14307A).*

A



B

Figure 5.31. *Type 22: passive lapidary abraders. A) A passive lapidary abrader from 29SJ 1360, Kiva B, Bench Contact (FS 660). B) A small passive lapidary abrader from 29SJ 633, Room 8, Level 7 (FS 557). (NPS Chaco Archive Negative Nos. 14263D and 18366).*

Table 5.82. Weights of passive lapidary abraders.

	29SJ 629 Only		Other Sites		Both Groups	
Weight (g)	No.	%	No.	%	No.	%
1-199	32	38.7	5	14.3	37	31.4
200-399	2	2.4	1	2.9	3	2.5
400-599	3	3.6	-	-	3	2.5
600-799	1	1.2	-	-	1	0.8
800-999	2	2.4	-	-	2	1.6
1000-1199	1	1.2	3	8.6	4	3.3
1200-1399	-	-	1	2.9	1	0.8
1800+	2	2.4	7	20.0	9	7.6
Unknown	40	48.2	18	51.4	58	49.3
Totals	83	100.1	35	100.1	118	99.8

	29SJ 629 Only	Other Sites	Both Groups
Sample size	83	35	118
$\bar{x}$	312.07 g	1,276.94 g	585.45 g
sd	624.48 g	1,000.91 g	861.13 g
range	18-2,920 g	83-2,871 g	18-2,920 g

Table 5.83. Dimensions of passive lapidary abraders.

		29SJ 629 Only		Other Sites		Both Groups	
Dimensions (cm)		No.	%	%	%	No.	%
Length							
1-4		2	2.4	-	-	2	1.7
5-9		22	26.6	2	5.7	24	20.4
10-14		14	16.9	2	5.7	16	13.6
15-19		5	6.0	2	5.7	7	5.9
20-24		3	3.6	3	8.6	6	5.1
25-29		-	-	7	20.0	7	5.9
30-34		1	1.2	2	5.7	3	2.5
50-54		1	1.2	-	-	1	0.8
Unknown		35	42.2	17	48.6	52	44.2
Totals		83	100.1	35	100.0	118	100.1
	x̄	11.52 cm		21.33 cm		14.19 cm	
	sd	8.19 cm		7.59 cm		9.11 cm	
	range	4-52 cm		6-30 cm		4-52 cm	
Width							
1-4		13	15.7	1	2.9	14	11.9
5-9		35	42.3	7	20.0	42	35.6
10-14		7	8.4	7	20.0	14	11.9
15-19		3	3.6	9	25.7	12	10.2
20-24		1	1.2	1	2.9	2	1.7
25-29		1	1.2	-	-	1	0.8
30-34		1	1.2	-	-	1	0.8
Unknown		22	26.5	10	28.6	32	27.1
Totals		83	100.1	35	101.1	118	100.0
	x̄	7.98 cm		12.08 cm		9.17 cm	
	sd	5.96 cm		4.35 cm		5.82 cm	
	range	2-33 cm		4-20 cm		2-33 cm	
Thickness							
1		70	84.3	17	48.6	87	73.7
2		6	7.2	9	25.7	15	12.7
3		5	6.0	5	14.3	10	8.5
4		1	1.2	-	-	1	0.8
7		-	-	1	2.9	1	0.8
Unknown		1	1.2	3	8.6	4	3.4
Totals		83	99.9	35	101.1	118	99.9
	x̄	1.23 cm		1.78 cm		1.38 cm	
	sd	0.61 cm		1.21 cm		0.86 cm	
	range	1-4 cm		1-7 cm		1-7 cm	

Table 5.84. Materials, plan views and previous forms of passive lapidary abraders.

	29SJ 629 Only		Other Sites		Both Groups	
Material	No.	%	No.	%	No.	%
Soft sandstone	2	2.4	-	-	2	1.7
Medium sandstone	4	4.8	1	2.9	5	4.2
Hard sandstone	31	37.3	9	25.7	40	33.9
Very hard sandstone	46	55.4	21	60.0	67	56.8
Siltstone	-	-	3	8.6	3	2.5
Limestone	-	-	1	2.9	1	0.8
Totals	83	99.6	35	100.1	118	99.9
Shape						
Rectilinear	16	19.3	19	54.3	35	29.7
Circular	1	1.2	2	5.7	3	2.5
Other	33	39.8	7	20.0	40	33.9
Unknown	33	39.8	7	20.0	40	33.9
Totals	83	100.1	35	100.0	118	100.0
Previous Form						
None	70	84.3	28	80.0	98	83.1
Slab cover	4	4.8	-	-	4	3.4
Anvil	1	1.2	-	-	1	0.8
Unknown	8	9.6	7	20.0	15	12.7
Totals	83	99.9	35	100.0	118	100.0

Table 5.85. Manufacture of passive lapidary abraders.

	29SJ 629 Only		Other Sites		Both Groups	
Type of Manufacture	No.	%	No.	%	No.	%
None	54	65.1	4	11.4	58	49.2
Flaked	23	27.7	1	2.9	24	20.3
Abraded	1	1.2	8	22.9	9	7.6
Pecked	-	-	1	2.9	1	0.8
Flaked and abraded	1	1.2	15	42.8	16	13.6
Pecked and flaked	-	-	1	2.9	1	0.8
Pecked and abraded	-	-	1	2.9	1	0.8
Flaked, pecked, abraded	-	-	3	8.6	3	2.5
Unknown	4	4.8	1	2.9	5	4.2
Totals	83	100.0	35	100.2	118	99.8
Amount of Work Invested						
None, unmodified	55	66.1	4	11.4	59	50.0
Slight	20	24.1	4	11.4	24	20.3
Moderate	4	4.8	10	28.6	14	11.7
Extensive	-	-	17	48.6	17	14.4
Mixed	4	4.8	-	-	4	3.4
Totals	83	99.8	35	100.0	118	99.8

Table 5.86. Characteristics of the primary use surface of passive lapidary abraders.

	29SJ 629 Only		Other Sites		Both Groups	
Area (cm^2)	No.	%	No.	%	No.	%
1-19	15	18.0	1	2.9	16	13.6
20-39	12	14.4	2	5.7	14	11.8
40-59	6	7.2	-	-	6	5.1
60-79	2	2.4	1	2.9	3	2.5
80-99	1	1.2	1	2.9	2	1.7
100-119	2	2.4	-	-	2	1.7
120-139	1	1.2	1	2.9	2	1.7
180-199	1	1.2	1	2.9	2	1.7
200-249	3	3.6	3	8.6	6	5.1
250-299	-	-	1	2.9	1	0.8
300-349	-	-	5	14.3	5	4.2
350-399	-	-	1	2.9	1	0.8
450-499	-	-	1	2.9	1	0.8
Unknown	40	48.2	17	48.2	57	48.3
Totals	83	99.8	35	100.4	118	99.8
	$\bar{x}$	49.58 cm^2	215.05 cm^2		98.41 cm^2	
	sd	59.01 cm^2	137.52 cm^2		116.56 cm^2	
	range	2-240 cm^2	2-493 cm^2		2-493 cm^2	

Use Surface	Occurrence	%	Occurrence	%	Occurrence	%
1	13	15.7	8	22.9	21	17.8
2	24	29.0	18	51.5	42	35.7
3	15	18.1	5	14.3	20	17.0
4	10	12.0	3	8.6	13	11.0
5	9	10.8	-	-	9	7.6
6	5	6.0	1	2.9	6	5.1
7	3	3.6	-	-	3	2.5
8	3	3.6	-	-	3	2.5
9	1	1.2	-	-	1	0.8
Totals	83	100.0	35	100.2	118	100.0

Table 5.87. Other characteristics of use surface contours on passive lapidary abraders.

	29SJ 629 Only		Other Sites		Both Groups	
Surface Contour	No.	%	No.	%	No.	%
Irregular	27	9.8	4	5.2	31	8.8
Flat	42	15.3	25	32.5	67	19.1
Slightly concave	85	31.0	20	26.0	105	30.0
Concave	60	21.9	15	19.5	75	21.4
Slightly convex	38	13.9	7	9.1	45	12.8
Convex	23	8.4	6	7.8	29	8.3
Total No. of surfaces	275	100.3	77	100.1	352	100.4
Location						
Opposite or angled	61	32.3	22	57.9	83	36.5
Adjacent non-right	28	14.8	2	5.3	30	13.2
Adjacent right	18	9.5	11	28.9	29	12.6
Same plane, parallel	59	31.3	1	2.6	60	26.4
Same plane, random	23	12.2	2	5.3	25	11.0
Totals	189	100.1	38	100.0	227	99.7

Table 5.88. Amount of use of passive lapidary abraders.

	29SJ 629 Only		Other Sites		Both Groups	
Primary Use	No.	%	No.	%	No.	%
Light	25	30.1	6	17.1	31	26.3
Moderate	58	69.9	26	74.3	84	71.2
Unknown	-	-	3	8.6	3	2.5
Totals	83	100.0	35	100.0	118	100.0
Secondary Use						
None	71	85.5	7	20.0		
Active abrader	-	-	1	2.9		
Anvil	-	-	1	2.9		
Hammerstone	1	1.2	-	-		
Chopper	11	13.3	4	11.4		
Unknown	-	-	22	62.9		
Totals	83	100.0	35	100.1		

are pictured and described in Judd (1954); Dutton (1938) reports eight "lapidary stones" with no description; Vivian and Mathews (1965) neither describe nor enumerate them but do picture them; and for Bc 51 (Brand et al. 1937), they were pictured but not described as such. None of these was the small variety found at 29SJ 629.

There is a strong correlation between passive lapidary abraders and turquoise debris, especially at 29SJ 629 (Table 5.89). They also rarely show up in the sites earlier than Pueblo II times; the amount of turquoise in earlier sites is also limited compared to that recovered from the Pueblo II sites.

Type 24: Mortars, Type 25: Pecked-hole Abraders, and Type 29: Paint Mortars

These three groups will be described together because they are similar. Type 24 includes mortars without pigment, Type 25 includes stones with pits or pecked depressions and which may or may not have been used in a manner similar to a mortar, and Type 29 includes those which are paint mortars (Figures 5.32-5.33). All occur in very small numbers and all were found at Pueblo Alto (29SJ 389). Three mortars were found, one was complete; two pecked-hole abraders were found, both were complete; and one complete paint mortar was found.

Table 5.89. Associations of passive lapidary abraders with turquoise debris.

Provenience	Debris	Modified debris	Unmod. bulk	Other
Pueblo Alto (29SJ 389)				
2 Kiva 10, fill	t	0	0	1 Inlay
Una Vida (29SJ 391)				
1 Room 83, floor feature	0	0	0	
29SJ 627				
1 Room 5, floor 1	0	t	t	1 Pendant
1 Room 16, floor 1	t	+	0	
1 Room 17, floor 1	0	0	t	
2 Kiva D, floor 1	t	t	0	
29SJ 629				
31 Plaza, other pit 1	+	+	+	
1 Plaza, other pit 14	x	t	t	
2 Kiva 1, floor	0	0	t	
1 Pithouse 2, floor	+	+	+	
1 Pithouse 3, floor	x	x	t	In floor fill
1 Room 1, fill	t	t	t	
2 Room 3, floor	t	0	t	
4 Room 5, fill and feature	x	+	x	
5 Room 6, fill and floor	t	0	0	
2 Plaza Grid 16, fill	?	?	?	
29SJ 1360				
4 Kiva B, floor	x	+	x	Beads and pendant

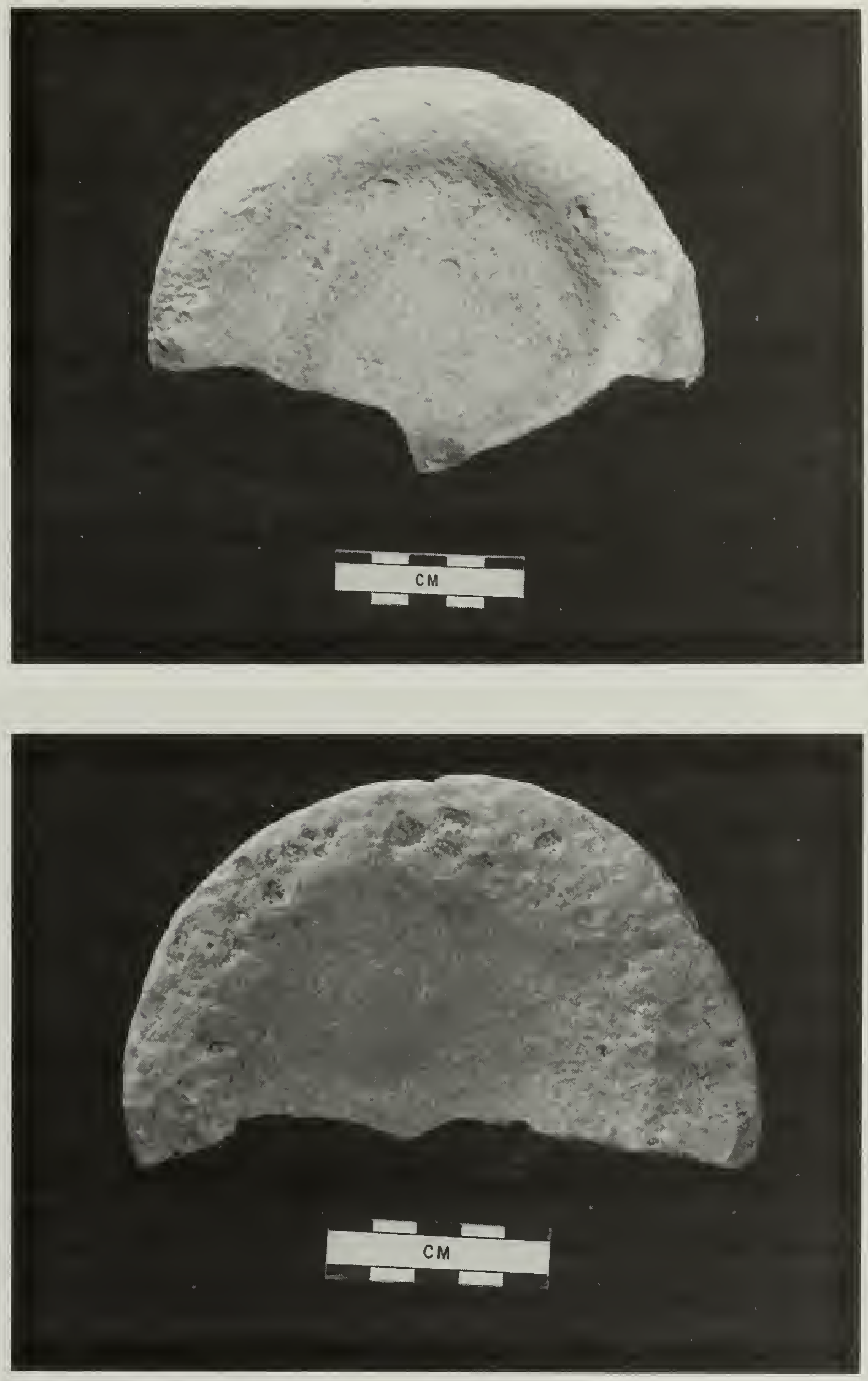
0 = absent t = trace 1-3 x = present 3-5 + = many 6+

Type 23: Whetstones

Ideally, this category was to be used for stones that were used for sharpening other tools, such as axes. Unfortunately, it is extremely difficult to say with certainty that this was the purpose of an individual artifact. For this reason, no abraders have been assigned to this type. Some probably were included in Type 20, passive abraders.

Dimensional Variables. Dimensions are presented in Table 5.90.

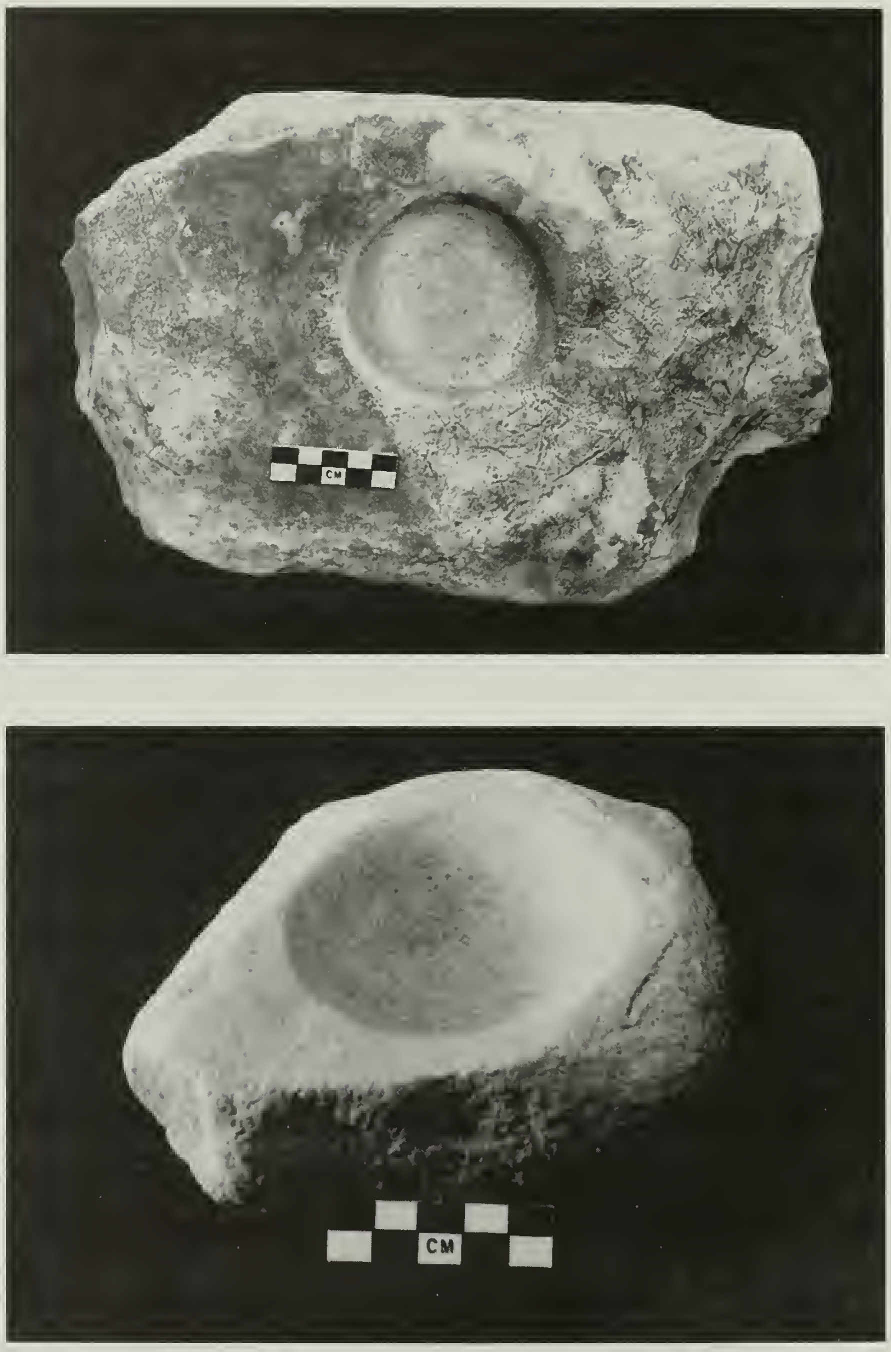
Material and Technology. All of the mortars and the paint mortar were made of hard sandstone. The pecked-hole abraders, however, were both of soft sandstone, suggesting a different function. All were of fine or very fine-grained sandstones. One of the pecked-hole abraders was rectilinear in shape,



A

B

Figure 5.32. *Type 24: mortars. A) A mortar from 29SJ 389, Other Structure 7, Wall Clearing (FS 464). B) A mortar from 29SJ 389, Room 200, Wall Clearing (FS 441). (NPS Chaco Archive Negative Nos. 16089C and 16097A).*



A

B

Figure 5.33. Type 25: pecked-hole abrader and Type 29: paint mortar. A) A pecked-hole abrader from 29SJ 389, Room 127, Wall Clearing (FS 230). B) A paint mortar from 29SJ 389, Room 103, Floor Fill (FS 1138). (NPS Chaco Archive Negative Nos. 16077A and 16066A).

Table 5.90. Dimensions of mortars, pecked-hole abraders, and paint mortar.

Dimension	Mortar	Pecked-hole Abrader	Paint Mortar
Weight (g)	8,400	1,800	1,197
	(unknown 2)	4,672	-
Length (cm)	33	21	14
	(unknown 2)	24	-
Width (cm)	13	8	12
	15	12	-
	(unknown 1)	-	-
Thickness (cm)	7	9	5
	7	10	-
	8	-	-

Table 5.91. Characteristics of the use surface of mortars, pecked-hole abraders, and paint mortar.

	Mortars	Pecked-hole Abraders	Paint Mortar
	65 cm	25 cm	75 cm
	85 cm	40 cm	-
Contour			
Flat	-	1	1
Slightly concave	-	1	-
Concave	3	3	1

two of the mortars were circular, and one mortar, one pecked-hole abrader, and the paint mortar were other-shaped.

Both mortars had previous forms as concretions. Manufacturing techniques included flaking for one mortar, abrading for one of the pecked-hole abraders, and pecking for the other two mortars and the other pecked-hole abrader. The paint mortar was pecked and abraded. Manufacture effort was rated as one moderate and two extensive for the mortars, two lights for the pecked-hole abraders, and extensive for the paint mortar.

Characteristics of the Use Surface. Table 5.91 indicates the areas of primary use and the surface contours on the mortars, pecked-hole abraders, and paint mortar. The degree of primary wear was recorded as light twice and medium once for the mortars, light for the pecked-hole abraders, and moderate for the paint mortar.

The number of use surfaces was one for all the mortars, two for one flat and one slightly-concave pecked-hole abrader, three for the other pecked-hole abrader, and two for the paint mortar. Never was there more than one mortar use surface. The surface locations are opposite for the paint mortar and on the same plane for the pecked-hole abraders.

Edge-rounding, cutting/gouging, pecking, or other wear did not occur on these abraders. Grinding was characteristic of all and moderate striations were found on the paint mortar. Staining was characteristic of the paint mortar.

Secondary Use. There was no recognizable secondary use of any of these abraders.

Comments. It is very difficult to make statements about groups of abraders with such small sample sizes. The mortars were all found in wall clearing proveniences. The pecked-hole abraders could have been used for finishing off the ends of wooden objects.

Woodbury (in Brand et al. 1937) described four round stone dishes that he thought may have been

used as paint pots; these were with two hammerstones that could have been used as pestles, but he did not call these mortars. He later discussed mortars and pestles but does not reveal whether or not any were found at Bc 51. At Bc 50 (Kluckhohn 1939), most abraders were made from concretions in which the hollow centers had been utilized. One was described as carefully and symmetrically made. It had an interior cavity six inches in diameter (about 15 cm) and red pigment stains. These sound very much like our mortars and the paint mortar from Pueblo Alto.

Judd (1954) described three abraders, two from Pueblo del Arroyo and one from Pueblo Bonito. All of these were nicely shaped and had far more work invested in them than those from Pueblo Alto or Bc 50. No mortars were reported from the Mesa Verde reports reviewed. Earl Morris noted six from Aztec Ruin (1919) and others at his La Plata sites (1939).

Type 26: Undifferentiated Palettes

The identification of palettes is difficult, chiefly because traces of pigment wash or wear off through acts of nature or handling by lab assistants, which makes them almost impossible to identify. Numerous other kinds of artifacts have pigment stains. When does one become a palette rather than a stained "other" artifact? For this analysis, any object that had another identifiable abrader use and light staining was not considered a palette. The palettes were placed in this group based on a moderate or heavy amount of staining, and when there was some selection or alteration which made it suitable for palette use (Figure 5.34). Specialized forms of palettes, such as those with raised borders and paint mortars, are discussed elsewhere. There were ten palettes identified from our excavations; only three were complete. The site distribution is shown in Table 5.92.

Dimensional Variables. Tables 5.93 and 5.94 present the weights and dimensions of palettes. Considering the small sample size and the large number of incomplete specimens, it is not surprising that there is much variation.

Material and Technology. All were made from sandstone, half hard and half very hard. The plan view varies, two rectilinear, three circular, one other, and four unknown. There was a diversity of previous forms; one concretion, one mano, and one slab cover. Four were unknown. Manufacture was extremely varied. All had one each of abraded, pecked, pecked and flaked, pecked and abraded, and flaked. Three were flaked and abraded. The amount of manufacture was light once, moderate four times, and extensive twice.

Characteristics of the Use Surface. The amount of primary use was rated moderate nine times and heavy once. Only three had measurable surface areas: 116, 130, and 320 cm^2 for an average of 188.66 cm^2 and a standard deviation of 113.9 cm^2 .

The number of use surfaces was one (six times) or two (four times). The second surface was always opposite the first. Fourteen use surfaces were recorded for an average of 1.4 per artifact. Surface contours were generally convex (Table 5.95). Other use occurred on several surfaces, generally as cutting/gouging or pecks.

Secondary Use. No secondary use was recorded.

Comments. These unspectacular artifacts are not reported in most site reports and were not found in the literature reviewed.

Type 27: Raised Bordered Palettes

One raised bordered palette was found in our excavations. It was incomplete and came from the fill of Room 7 at 29SJ 627 (Figure 5.35).

The palette was not complete in its long dimension. The width was 20 cm and it was 4 cm thick. It was constructed of hard sandstone and was rectilinear in shape, with no previous form. Manufacture was extensive pecking and abrading. The degree of primary use was moderate. The primary surface was concave and there was only one use surface. Wear on the use surface included moderate grinding and striations. The entire use surface was stained red. There was no secondary use.

Actual raised bordered palettes are not often found in Chaco Canyon. Judd (1954) pictured a double form from Pueblo del Arroyo.

Figure 5.34. *Type 26: undifferentiated palette. An undifferentiated palette from 29SJ 628, Pithouse E, Floor Contact (FS 616). Note that the edges of this mano have been flaked before its use as a palette. (NPS Chaco Archive Negative No. 14239D).*

Table 5.92. *Site distribution of undifferentiated palettes.*

Site Number	No.	%
29SJ 389	6	60.0
29SJ 627	1	10.0
29SJ 628	2	20.0
29SJ 629	1	10.0
Totals	10	100.0

Table 5.93. *Weights of undifferentiated palettes.*

Weight (g)	No.	%	Summary Statistics	
661	1	10.0		
768	1	10.0		
2,803	1	10.0		
Unknown	7	70.0	$\bar{x}$	1,410.66 g
Totals	10	100.0	sd	1,206.98 g

Table 5.94. Dimensions of undifferentiated palettes.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
9	-	-		
11	-	-		
12	1	10.0		
16	1	10.0		
18	1	10.0		
23	-	-		
26	1	10.0		
Unknown	6	60.0	x̄	18.00 cm
Totals	10	100.0	sd	5.89 cm
Width				
9	1	10.0		
11	1	10.0		
12	1	10.0		
16	1	10.0		
18	-	-		
23	1	10.0		
26	-	-		
Unknown	5	50.0	x̄	14.20 cm
Totals	10	100.0	sd	5.54 cm
Thickness				
1	2	20.0		
2	3	30.0		
3	3	30.0		
5	1	10.0		
Unknown	1	10.0	x̄	2.44 cm
Totals	10	100.0	sd	1.24 cm

Table 5.95. Characteristics of the primary use surface of undifferentiated palettes.

Surface Contour	No.	%			
Irregular	1	7.1			
Flat	3	21.4			
Slightly concave	5	35.7			
Concave	3	21.4			
Slightly convex	1	7.1			
Convex	1	7.1			
Totals	14	99.8			
Type of Use	None	Light	Medium	Heavy	Characteristic
Edge-rounding	7	3	-	-	-
Cutting/gouging	7	1	2	-	-
Grinding/polish	-	-	-	-	10
Striations	1	-	9	-	-
Pecks	9	-	1	-	-
Staining	-	-	-	-	10

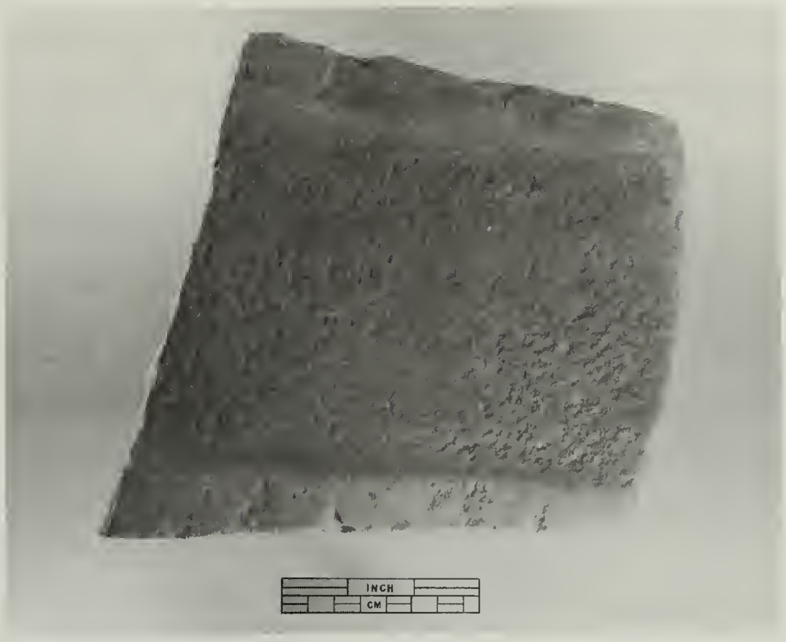


Figure 5.35. *Type 27: raised bordered palette. A red-stained raised bordered palette from 29SJ 627, Room 7, Level 2 (FS 279). (NPS Chaco Archive Negative No. 14295D).*

Type 28: Incidental Palettes

Most archeological excavations produce numerous pieces of stone, ground or unground, with pigment stains. If an artifact did not fit into any other abrader type and it was stained, it was placed in this group. The majority of these are simply pieces of sandstone with no modification but which are pigment stained. Twenty-four of these were identified (Table 5.96), nineteen were judged complete (79.2 percent).

Table 5.96. *Site distribution of incidental palettes.*

Site Number	No.	%
29SJ 389	16	66.7
29SJ 628	2	8.3
29SJ 629	4	16.7
29SJ 633	2	8.3
Totals	24	100.0

Dimensional Variables. Due to the nature of this type, the dimensions will be reported only as basic statistics (Table 5.97).

Material and Technology. The material was generally sandstone, but there was an exception. One was soft sandstone (4.2 percent), 20 were hard sandstone (83.3 percent), two were very hard sandstone (8.3 percent), and one was banded chert.

Six were rectilinear (25.0 percent), one was circular (4.2 percent), 13 were other (54.2 percent), and four were unknown (16.7 percent). Recognizable previous forms included one as a slab cover and one as an "other." The manufacture, when it occurred, was slight. Eighteen had none, one was flaked, three were abraded, another was pecked, and one was unknown.

Characteristics of the Use Surface. The amount of use was most often light, 20 instances (83.3 percent), and four were moderate (16.7 percent). The area of the use surface varied (Table 5.98) but was usually small.

Twenty-one (88.2 percent) had single-use surfaces and three had double-use surfaces (12.5 percent). Those with double surfaces were located opposite the primary use surface. Surface contours were most often irregular (Table 5.98).

Table 5.97. Dimensional variables of incidental palettes.

Measure	Weight	Length	Width	Thickness
Sample size	19	19	21	24
x̄	430.74	11.16	8.00	1.92
sd	619.22	5.00	3.05	1.02
Range	18-2,180	5-21	3-13	1-4

Table 5.98. Characteristics of the primary use surface of incidental palettes.

Area (cm^2)	No.	%	Summary Statistics		
1-19	9	37.5			
20-39	3	12.5			
40-59	1	4.2			
60-79	1	4.2			
80-99	1	4.2			
100-119	1	4.2			
120-139	1	4.2			
140-159	2	8.3			
Unknown	5	20.8	x̄ 47.11 cm^2 sd 51.36 cm^2		
Totals	24	100.1	range 3-158 cm^2		
Surface Contour					
Irregular	15	55.5			
Flat	7	25.9			
Slightly concave	4	14.8			
Concave	1	3.7			
Totals	27	99.9			
Type of Use	None	Light	Medium	Heavy	Characteristic
Edge-rounding	22	2	-	-	-
Cutting/gouging	23	1	-	-	-
Grinding/polish	11	5	8	-	-
Striations	20	3	1	-	-
Pecks	24	-	-	-	-
Staining	-	-	-	-	24

Secondary Use. One secondary use was recorded; light chopper use was located on the edge.

Comments. One-third of the incidental palettes were found in floor or floor association contexts of rooms and pithouses, quite high for an artifact type with such a low energy investment (Figure 5.36). Perhaps this suggests that they were used on the spur of the moment or for everyday use. No mention of these was found in the literature reviewed.

Figure 5.36. Type 28: incidental palette. An incidental palette from 29SJ 628, Pithouse D, Floor Contact (FS 727). (NPS Chaco Archive Negative No. 14276B).

Grooved Abraders

Grooved abraders are found less frequently in archeological sites than one would expect. Judd (1954) referred to these as arrow shaft smoothers and considered them active abraders. He notes that they were also used for smoothing willow shoots for house roofs and rounding spindle shafts and other slender objects of wood.

Woodbury (1954) distinguished between simple grooved abraders, such as those with little or no intentional shaping but which are abrasive, and those of intentionally produced shapes which were non-abrasive shaft smoothers. Shaft smoothers were described as elongated, loaf-shaped, ridged, transversely grooved, and simple. He listed other possible uses as awl sharpening, smoothing of cotton yarn, preparing materials for basketmaking, shaping beads which have been perforated, and other woodworking. He also stated that, in the "history" of the artifact, they were rare in the San Juan and Chaco drainages but not entirely absent.

Grooved abraders range from one to five percent of the sample for each site, with a sample size of over 100. Table 5.99 gives some comparative figures for the various types of grooved abraders.

Table 5.99. Grooved abraders.

	Type			
Measure	30	31	32	33
Number	33	9	4	1
Number complete	29	9	1	1
Percent complete	87.9	100.0	25.0	100.0
Mean weight	491.4	439.1	698.0	337.0
Mean length	10.5	9.3	11.2	11.0
Mean width	7.2	8.2	9.5	10.0
Mean thickness	4.7	4.7	3.0	3.0
Mean surface area	11.2	5.3	3.2	3.0

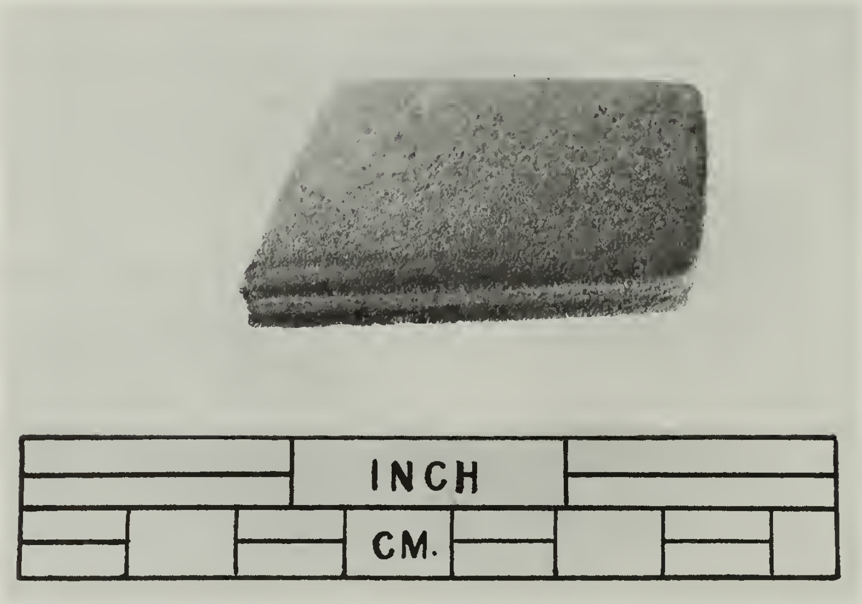
30 = Undifferentiated grooved abrader.
31 = Shaft sharpener.
32 = Decorative grooved rock.
33 = Sharpener.

Type 30: Undifferentiated Grooved Abraders

Abrading stones are usually categorized as shaft smoothers or shaft straighteners. In this analysis only a few were assigned functions. Those in the undifferentiated group are quite variable (Figures 5.37-5.39). The sample size is small and the percentage of a site's abrader assemblage represented by these abraders is low, generally one to three percent. Thirty-three undifferentiated grooved abraders were recovered from our excavations (Table 5.100), 29 or 87.9 percent were complete.

Dimensional Variables. Tables 5.101 and 5.102 present weights and dimensions for undifferentiated grooved abraders. Although the sample size is small there is some clustering of sizes in each of the dimensions.

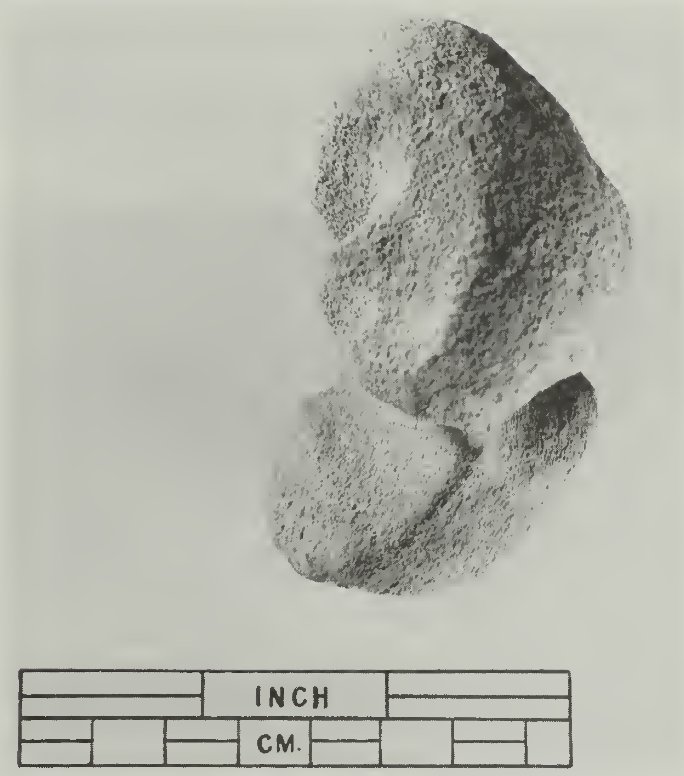
A



B

Figure 5.37. *Type 30: undifferentiated grooved abraders. A) A grooved abrader from 29SJ 627, Kiva E, Layer 4 (FS 5881). B) A grooved abrader from 29SJ 627, Kiva E, Layer 5 (FS 6178). (NPS Chaco Archive Negative Nos. 14227B and 14275B).*

A



B

Figure 5.38. *Type 30: undifferentiated grooved abraders. A) A grooved abrader from 29SJ 389, Circular Structure 1, Wall Clearing (FS 115). B) A grooved abrader from 29SJ 1360, Trash Mound (FS 50). (NPS Chaco Archive Negative Nos. 16082A and 14312B).*

Figure 5.39. *Type 30: undifferentiated grooved abraders. A) A grooved abrader from 29SJ 389, Kiva 15, Layer 7. B) A grooved abrader from 29SJ 389, Grid 35, Layer 4 (FS 4166). (NPS Chaco Archive Negative Nos. 15846 and 16075A).*

Table 5.100. Site distribution of grooved abraders.

Site Number	No.	%
29SJ 389	18	54.5
29SJ 423	1	3.0
29SJ 627	4	12.1
29SJ 628	3	9.1
29SJ 629	2	6.1
29SJ 1360	2	6.1
29SJ 1659	1	3.0
Totals	33	100.0

Table 5.101. Weights of grooved abraders.

Weight (g)	No.	%	Summary of Statistics	
1-99	1	3.0		
100-199	9	27.4		
200-299	7	21.3		
300-399	2	6.1		
400-499	4	12.1		
500-599	1	3.0		
600-699	1	3.0		
900-999	1	3.0		
1200-1299	1	3.0		
1700-1799	1	3.0		
3200-3299	1	3.0		
Unknown	4	12.1	$\bar{x}$	491.41 g
			sd	655.76 g
Totals	33	100.0	range	23-3,276 g

Table 5.102. Dimensions of undifferentiated grooved abraders.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
1-4	1	3.0		
5-9	12	36.6		
10-14	11	33.5		
15-19	3	9.1		
20-24	1	3.0		
25-29	1	3.0		
Unknown	4	11.8	x̄	10.55 cm
			sd	4.63 cm
Totals	29	88.2	range	4-26 cm
Width				
1-4	4	12.1		
5-9	24	73.2		
10-14	4	12.1		
15-19	1	3.0		
20-24	-	-		
25-29	-	-		
Unknown	-	-	x̄	7.21 cm
			sd	3.08 cm
Totals	33	100.4	range	3-18 cm
Thickness				
1-2	5	15.2		
3-4	12	36.4		
5-6	10	30.5		
7-8	5	15.2		
13	1	3.0	x̄	4.66 cm
			sd	2.34 cm
Totals	33	100.3	range	1-13 cm

Material and Technology. Sandstone is the most common material found, usually fine or very fine-grained. Soft sandstone accounted for 29 abraders (87.9 percent of the total), medium sandstone one (3.0 percent), hard sandstone two (6.1 percent), and quartzite one (3.0 percent). The soft sandstone would be best for shaping reed or wooden shafts; bone would probably require a harder material. Very hard materials would more likely be used for polishing or straightening rather than shaping.

The grooved abraders usually are other-shaped (26 or 78.8 percent), four were rectilinear (12.1 percent), one was circular, and two were unknown. Previous forms were not common, twenty-nine had none (87.9 percent), one was a concretion, one was a river cobble, and two were abraders. As with most groups where the primary material was soft sandstone, evidence of manufacture was rare. Twenty-five abraders (75.8 percent) had none, one was flaked, six (19.2 percent) were abraded, and one was pecked and abraded. The amount of effort or labor investment was light five times, moderate once, and extensive twice.

Characteristics of the Use Surface. Use was generally light or moderate and use areas tended to be small (Table 5.103). The one very large surface area is not an error but a very large grooved abrader (see Figure 5.39b). The number of use surfaces for this variable was difficult. More than nine did occur but that was all that was allowed in the coding system. In two instances the total number of use surfaces could not be recorded. This gives a total of 99+ use surfaces for the 33 abraders or an average of three use surfaces per abrader. As expected, most of the use surfaces were concave or slightly concave (Table 5.104), and the locations for the surfaces are

Table 5.103. Characteristics of the primary use surface of undifferentiated grooved abraders.

Amount of Use	No.	%	Summary Statistics	
Light	18	54.5		
Moderate	12	36.4		
Heavy	3	9.1		
Totals	33	100.0		
Area (cm²)				
1-9	19	57.9		
10-19	7	21.3		
20-29	2	6.0		
30-39	1	3.0		
100+	1	3.0		
Unknown	3	9.1	$\bar{x}$	11.16 cm²
			sd	18.23 cm²
Totals	33	100.3	range	1-100 cm²
Use Surface	Occurrences	%		
1	13	39.6		
2	6	18.3		
3	7	21.3		
4	2	6.1		
5	2	6.1		
6	1	3.0		
11+	1	3.0		
18+	1	3.0		
Totals	33	100.4		

Table 5.104. Other characteristics of the primary use surfaces of undifferentiated grooved abraders.

Surface Contour	No.	%			
Flat	4	4.0			
Slightly concave	11+	11.1			
Concave	66	66.6			
Slightly convex	4	4.0			
Convex	14	14.1			
Totals	99	99.8			
Location	Occurrences				
Opposite or angled	21+				
Adjacent non-right	9+				
Adjacent, right	22+				
Same plane, parallel	11+				
Same plane, random	13				
Type of Use	None	Light	Medium	Heavy	Characteristic
Edge-rounding	32	1	-	-	-
Cutting/gouging	32	-	1	-	-
Grinding/polish	-	-	-	-	33
Striations	28	2	3	-	-
Pecks	32	1	-	-	-
Staining	32	-	-	1	-

complex. Wear other than grinding is relatively uncommon (Table 5.104), suggesting that these undifferentiated grooved abraders are specialized tools that were used mostly for one primary function or were used briefly then discarded.

Secondary Use. Twenty-nine had no secondary use (87.9 percent). Those which did have secondary use consisted of one palette, one grooved abrader, one anvil, and one chopper. Secondary use was light twice, moderate once, and heavy once. The location was opposite once, adjacent right-angled once, the whole artifact once, and ends and edges once.

Comments. Other wear is relatively uncommon and suggests that grooved abraders were either unifunctional tools or used briefly and discarded. None of the grooved abraders were found in primary context.

Some of the more interesting of this group deserve individual comment. The abrader from 29SJ 389, Kiva 15, the modified quartzite cobble, is the only one in this collection that Woodbury (1954) would identify as a "loaf shaped shaft-smoother" (Figure 5.39A). One other very similar to this was reported from Kiva 2, Bc 51 (see Toulouse in Kluckhohn and Reiter 1939).

Another example is a problematical artifact from 29SJ 627, Kiva E fill (Figure 5.37B). It was made of very hard sandstone and had a groove on the edge. Judd (1954:86) illustrated a similar artifact from Pueblo Bonito and suggested that it was used to round beads.

The last is quite interesting because of the large size of the groove. It was found at 29SJ 389 in the fill of the Plaza I, Grid 35, Layer 4 (Figure 5.39B).

Type 31: Shaft Shapers

This group consists of tools that look like shaft straighteners. The grooves are about shaft diameter, are long enough to do some good, and are of uniform diameter (Figure 5.40). Nine of these were found and all were complete (Table 5.105).

Dimensional Variables. All shaft shapers are small, hand-sized or less. They tend to be thicker than other actively used abraders (Tables 5.106 and 5.107).

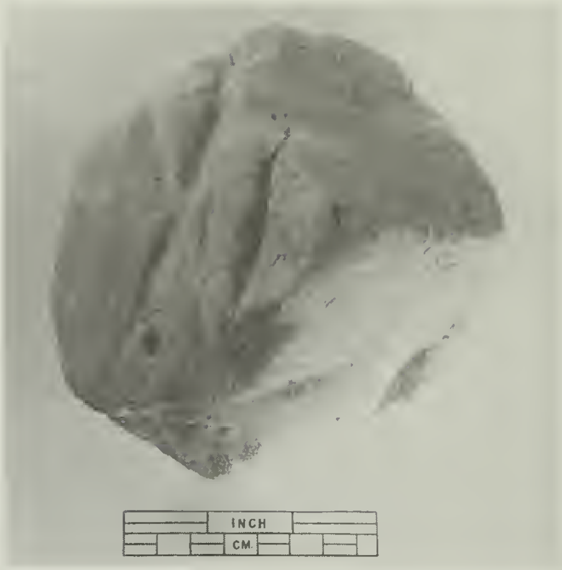


Figure 5.40. Type 30: shaft shaper. A possible shaft shaper from 29SJ 628, Pithouse E, Vent Shaft (FS 301). (NPS Chaco Archive Negative No. 14291B.)

Materials and Technology. All were fine-grained soft sandstone. The plan views were usually "other" (seven times or 77.8 percent), with one each of rectilinear and circular. One had a previous use as an abrader. Only two kinds of manufacture were found; one was flaked and three were abraded. The manufacture was always light.

Characteristics of the Use Surface. The degree of primary use was light twice and moderate seven times. Multiple surfaces are more common than single (Table 5.108). A total of 31 surfaces were recorded for the nine shaft shapers, an average of 3.4 per abrader. The surface contours of seven were slightly concave and concave on 24. Locations of other use surfaces are given in Table 5.108. Other wear on shaft shapers occurred twice, once as a light amount of cutting and gouging and once as staining.

Secondary Use. There was no secondary use of these abraders, probably due to their specialized nature or the soft sandstone material.

Comments. Shaft smoothers have been reported for many sites. Toulouse (in Kluckhohn and

Table 5.105. Site distribution of shaft shapers.

Site Number	No.	%
29SJ 389	4	44.4
29SJ 627	1	11.1
29SJ 628	4	44.4
Totals	9	99.9

Table 5.106. Weights of shaft shapers.

Weight (g)	No.	%	Summary Statistics	
1-199	4	44.4		
200-399	1	11.1		
400-599	2	22.2		
800-999	1	11.1		
1200-1399	1	11.1	$\bar{x}$	439.11 g
			sd	439.79 g
Totals	9	99.9	range	35-1,327 g

Table 5.107. Dimensions of shaft shapers.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
3-4	1	11.1		
5-6	1	11.1		
7-8	1	11.1		
9-10	2	22.2		
11-12	2	22.2		
13-14	2	22.2	$\bar{x}$	9.33 cm
			sd	3.20 cm
Totals	9	99.9	range	4-13 cm
Width				
3-4	1	11.1		
5-6	2	22.2		
7-8	1	11.1		
9-10	3	33.3		
11-12	2	22.2		
13-14	-	-	$\bar{x}$	8.22 cm
			sd	2.91 cm
Totals	9	99.9	range	3-12 cm
Thickness				
3-4	5	55.5		
5-6	2	22.2		
7-8	1	11.1		
9-10	1	11.1	$\bar{x}$	4.66 cm
			sd	2.12 cm
Totals	9	99.9	range	3-9 cm

Table 5.108. Characteristics of the primary use surface of shaft shapers.

Area (cm^2)	No.	%	Summary Statistics
3	3	33.3	
4	1	11.1	
6	2	22.2	
7	1	11.1	
8	2	22.2	$\bar{x}$ 5.33 cm^2
Totals	9	99.9	sd 2.13 cm^2
Use Surface	Occurrences	%	
1	1	11.1	
2	2	22.2	
3	3	33.3	
4	1	11.1	
5	1	11.1	
8	1	11.1	
Totals	9	99.9	
Location			
Opposite or angled	1		
Adjacent, right	7		
Same plane, parallel	9		
Same plane, random	5		
Unknown	1		
Totals	24		

Reiter 1939) noted two kinds of abrasive shaft smoothers. The first "worked into rectangular form with usually one groove-often used in pairs," and the second "rough or rounded natural pebbles with one, two or more grooves" (Kluckhohn and Reiter 1939:81).

Dutton (1938) pictured a shaft smoother but does not include it under her table of objects found. Judd (1954) noted several but considered them active abraders. Toulouse recorded one definite shaft smoother and three that might have been used as smoothers (Kluckhohn and Reiter 1939). From the Mesa Verde area, Hayes (1975), Rohn (1972), and Swannak (1965) report shaft smoothers.

Type 32: Decorative Grooved Rocks

These are grooved rocks, but the grooving appears to be decoration for a building rock or a doodle, rather than a tool (Figure 5.41). Four of these were found (Table 5.109); only one was complete.

Dimensional Variables. The complete specimen weighed 698 g. Length, width, and thickness do not vary much (Table 5.110), but the small sample size makes it difficult to generalize about decorated grooved rocks.

Material and Technology. The material was always sandstone; two soft, one medium, and one very hard. All were fine or very fine-grained. The shape was recorded as other twice and unknown twice. None had previous forms. All were abraded for manufacture, two lightly, one moderately, and one extensively.

Characteristics of the Use Surface. The degree of primary use was light once and moderate three times; here the rating was based on the amount of decor rather than use. The area of the grooves was small, one at 2 cm, one at 3 cm, and two at 4 cm. The number of surfaces or doodles on the rock varied. Three had eight and one had three. Three of the surfaces were flat and 24 were concave. The locations of these are unusual (Table 5.111). The only other wear recorded was one case of moderate striations and a light incidence of staining.

Secondary Use. One of these was reused as a chopper, lightly on an edge.

Figure 5.41. *A decorative grooved rock from 29SJ 389, Room 213, Wall Clearing (FS 555). (NPS Chaco Archive Negative No. 16098B).*

Comments. Decorative stones were incorporated into the walls at Pueblo Alto, Pueblo Bonito, and probably many other sites. Those in this sample were simply out of their architectural context.

Table 5.109. Site distribution of decorative grooved rocks.

Site Number	No.	%
29SJ 389	1	25.0
29SJ 627	2	50.0
29SJ 629	1	25.0
Totals	4	100.0

Table 5.110. Dimensions of decorative grooved rocks.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
8	1	25.0		
11	2	50.0		
15	1	25.0		
Unknown	-	100.0	x̄	11.25 cm
Totals	4	100.0	sd	2.87 cm
Width				
8	1	25.0		
11	1	25.0		
15	-	-		
Unknown	2	50.0	x̄	9.50 cm
Totals	4	100.0	sd	2.12 cm
Thickness				
1	1	25.0		
3	2	50.0		
5	1	25.0	x̄	3.00 cm
Totals	4	100.0	sd	1.63 cm

Table 5.111. Characteristics of the primary use surface of decorative grooved rocks.

Opposite or Angled	Adjacent Right	Same Plane Parallel	Same Plane Random	Frequency
-	-	1	1	1
-	2	1	4	1
3	-	2	-	1
6	2	6	7	1

Type 33: Point Sharpeners

Only one point sharpener was identified (Figure 5.42). It is characterized by a fan-shaped groove, which was probably produced by sharpening the point of a small object such as an awl. It was found while outlining walls at 29SJ 389 and was complete.

Dimensional Variables. The sharpener weighed 337g, was 11 cm long, 10 cm wide, and 3 cm thick.

Material and Technology. This sharpener was made of fine-grained medium sandstone. The shape was "other," and it had a previous use as an abrader. There was no manufacture.

Characteristics of the Use Surface. The degree of wear was moderate and the surface area was 3 cm^2. There were four surfaces, one slightly concave, and three concave. All were randomly located on the same plane. Striations were found on the use surfaces suggesting that a hard object was being worked.

Secondary Use. Light use as a hammerstone was found on the corners of this abrader.

Comments. This is not to suggest that there were no other point sharpeners at Chaco Canyon. More likely, these could have been made of hard sandstone which did not leave the characteristic wear pattern present on this softer stone. Areas in the cliff sandstone behind Pueblo Bonito and Chetro Ketl were used for this purpose (see Judd 1954:Plate 23).

Figure 5.42. A point sharpener from 29SJ 389, Other Structure 12, Wall Clearing (FS 593). (NPS Chaco Archive Negative No. 16087A).

Polishing Stones

Polishing or rubbing stones have been recognized and are commonly reported from Southwestern archeological sites. Most investigators separate rubbing and smoothing stones from pottery polishers, generally on the basis of size.

Table 5.112 gives a comparison of the basic dimensional variables for the types of polishers.

Type 40: Undifferentiated Polishers

Polishers are cobbles used for polishing surfaces, such as those of clay pots and floors. There were probably many other uses of which we are unaware. Some could have been used in the same manner as hard active abraders, but the cobble forms and hardness of the material would result in

Table 5.112. Polishing stones.

Measure	40	41	42	43	44
Sample size	189	71	65	13	2
Number complete	141	64	53	10	2
Percent complete	74.7	91.4	84.1	76.9	100.0
Mean weight	187.8	62.4	837.9	171.2	677.0
Mean length	6.6	5.1	11.5	5.9	10.5
Mean width	3.0	3.9	8.7	5.4	6.5
Mean thickness	5.1	1.8	5.1	4.0	6.5
Mean surface area	16.3	11.6	44.2	10.1	176.0

40 = Undifferentiated polishing stone.
41 = Pot polisher.
42 = Floor polisher.
43 = Broken edge abraded polisher.
44 = Lightning stone.
Note: Figures in tables could not be verified; errors may exist.

dissimilar wear (Figure 5.43). This undifferentiated group is composed of polishers that did not fit the criteria for either a pot or a large polisher. There were 189 of these polishers, 141 or 74.7 percent were complete. Site distributions are presented in Table 5.113.

Dimensional Variables. The undifferentiated polishers tend to be small; many are probably within the range of pot polishers (Tables 5.114 and 5.115).

Material and Technology. Cobbles of many kinds of material were used for polishers (Table 5.116). A small number were not made of cobbles but had wear patterns very similar to them.

The shape is dictated by the cobbles which make up the majority of the polishers, almost always circular (Table 5.117).

Manufacture was rarely necessary but did occur. Most polishers, 176 or 93.1 percent, had none, six were flaked (3.2 percent), one was abraded (0.5 percent), two were pecked (1.1 percent), and four were unknown (2.1 percent). The amount of work was almost evenly divided with five light and four moderate.

Characteristics of the Use Surface. Even light wear represents a considerable amount of use (Table 5.118). Before the object was accepted as a polishing stone, the surface had to have been modified in either texture or curvature. The harder materials require considerable use before use is apparent.

Use areas tended to be small (Table 5.118). Three hundred and seventy-five use surfaces were recorded for the 189 polishers, an average of 1.98 per polisher; their contours were generally convex or flat (Table 5.119).

The number of use surfaces varied, with double surfaces by far the most common. The locations of these surfaces are summarized since 15 configurations were found. The most frequent was a double surface on opposite faces (n = 128 or 67.8 percent).

Wear on polishers was relatively common (Table 5.119). The various kinds of wear suggest that, like active abraders, these were often multipurpose tools.

Secondary Use. Secondary use of undifferentiated polishers was rated light 47 times (31.0 percent), moderate 86 times (56.8 percent), extensive 18 times (11.9 percent), and was unknown once (Table 5.120).

Almost every cobble was used as a hammerstone or chopper; Table 5.120 gives the location of secondary use. In general, all but the very small polishers were used as hammerstones or choppers. The Chacoans used anything handy for occasional pounding. The pounding may also have

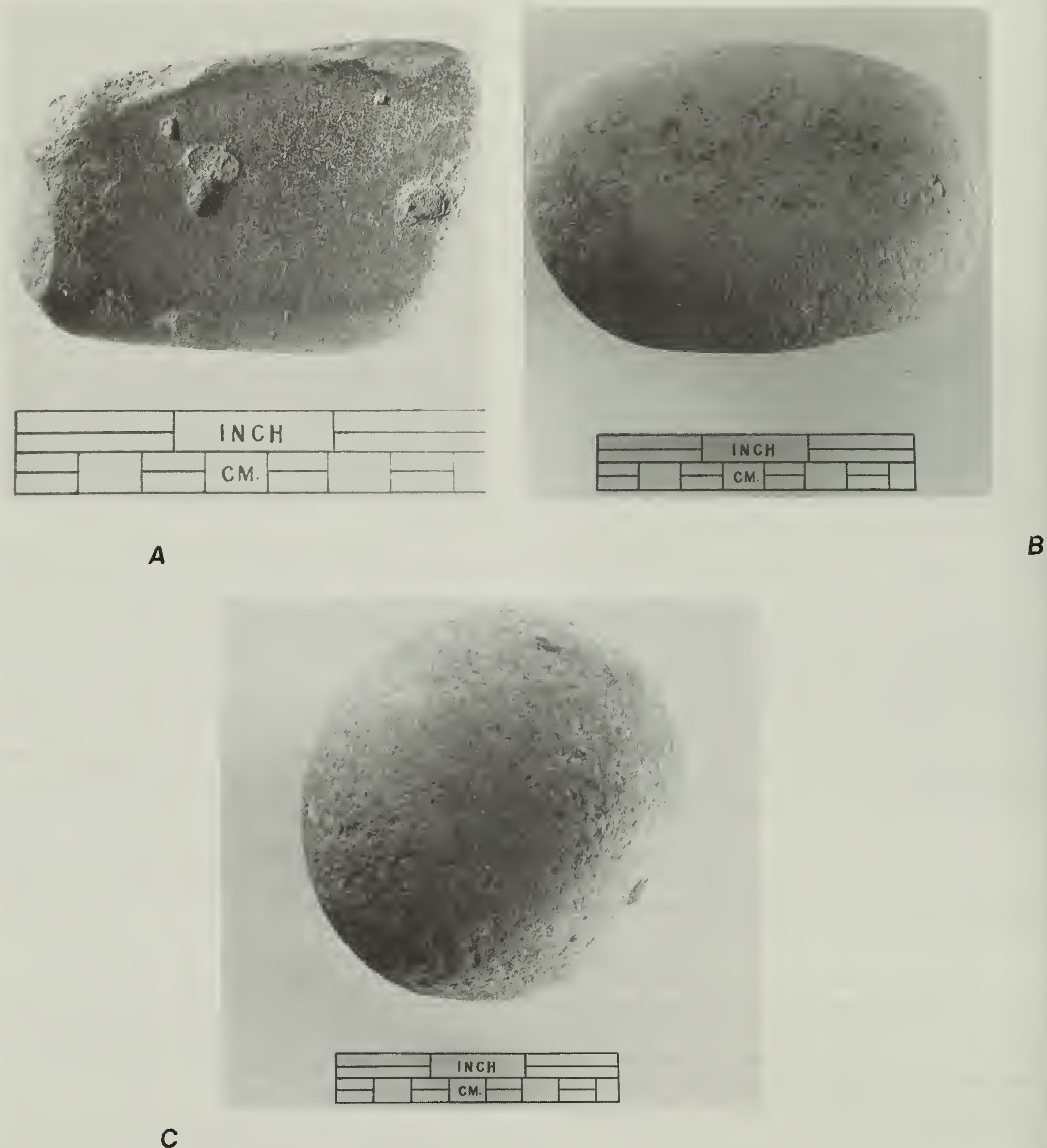


Figure 5.43. *Type 40: undifferentiated polishers. A) A polisher from 29SJ 724, Surface stripping (FS 431). B) A polisher from 29SJ 628, Pithouse C Antechamber, Level 3 (FS 461b). C) A sandstone polisher from 29SJ 628, Pithouse A Floor Contact (FS 129). (NPS Chaco Archive Negative Nos. 14254B, 14303A, and 14287A).*

Table 5.113. Site distribution of undifferentiated polishers.

Site Number	No.	%
29SJ 299	12	6.3
29SJ 389	17	9.0
29SJ 423	15	7.9
29SJ 627	57	30.2
29SJ 628	35	18.5
29SJ 629	24	12.7
29SJ 633	3	1.6
29SJ 721	1	0.5
29SJ 724	3	1.6
29SJ 1360	18	9.5
29SJ 1659	4	2.1
Totals	189	99.9

Table 5.114. Weights of complete undifferentiated polishers.

Weight (g)	No.	%	Summary Statistics
1-99	57	30.2	
100-199	35	18.5	
200-299	24	12.7	
300-399	10	5.3	
400-499	7	3.7	
500-599	2	1.1	
600-699	1	0.5	
700-799	3	1.6	
1000+	2	1.1	$\bar{x}$ 187.85 g
Totals	141	74.7	sd 200.14 g range 3-1,308 g

Table 5.115. Dimensions of undifferentiated polishers.

Dimensions (cm)	No.	%	Summary Statistics
Length			
1-2	2	1.1	
3-4	15	7.9	
5-6	59	31.3	
7-8	44	23.3	
9-10	19	10.1	
11-12	5	2.6	
13-14	1	0.5	
Unknown	44	23.3	x̄ 6.61 cm
			sd 2.04 cm
Totals	189	100.1	range 2-14 cm
Width			
1-2	8	4.2	
3-4	51	27.0	
5-6	84	44.5	
7-8	21	11.1	
9-10	2	1.1	
11-12	3	1.6	
Unknown	20	10.6	x̄ 5.11 cm
			sd 1.71 cm
Totals	189	100.1	range 1-11 cm
Thickness			
1-2	66	34.9	
3-4	82	43.4	
5-6	24	12.7	
7-8	2	1.1	
Unknown	15	7.9	x̄ 3.05 cm
			sd 1.44 cm
Totals	189	100.0	range 1-8 cm

Table 5.116. Materials of undifferentiated polishers.

Material	No.	%
Soft sandstone	1	0.5
Medium sandstone	1	0.5
Hard sandstone	1	0.5
Very hard sandstone	5	2.6
Limestone	1	0.5
Metamorphic	6	3.2
Granite	1	0.5
Igneous	5	2.6
Chert	2	1.1
Quartzite	157	83.1
Quartz	7	3.7
Other stone	2	1.1
Totals	189	99.9

Table 5.117. Shapes of undifferentiated polishers.

Plan View	No.	%
Rectilinear	4	2.1
Circular	156	82.5
Other	17	9.0
Unknown	12	6.3
Totals	189	99.9
Previous Form		
Natural	4	2.1
Concretion	1	0.5
River cobble	181	95.9
Mano	1	0.5
Unknown	2	1.1
Totals	189	100.1

Table 5.118. Characteristics of the primary use surface of undifferentiated polishers.

Amount	No.	%	Summary Statistics
Light	59	31.2	
Moderate	118	62.4	
Heavy	10	5.3	
Unknown	2	1.1	
Totals	189	100.0	
Area (cm^2)			
1-9	44	23.3	
10-19	59	31.3	
20-29	33	17.5	
30-39	4	2.1	
40-49	3	1.6	
50-59	1	0.5	
80-89	1	0.5	
90-99	1	0.5	
Unknown	43	22.8	$\bar{x}$ 16.34 cm^2
Totals	189	100.1	sd 12.65 cm^2 range 1-19 cm^2
Use Surface	Occurrences	%	
1	37	19.6	
2	128	67.8	
3	13	6.9	
4	8	4.2	
5	2	1.1	
Unknown	1	0.5	
Totals	189	100.1	

Table 5.119. Other characteristics of the primary use surface of undifferentiated polishers.

Surface Contour	No.	%			
Irregular	3	0.8			
Flat	41	10.9			
Slightly concave	7	1.9			
Concave	2	0.5			
Slightly convex	83	22.2			
Convex	238	63.5			
Unknown	1	0.3			
Totals	374	100.1			
Location					
Opposite or angled	151	80.0			
Adjacent, non-right	7	3.7			
Adjacent, right	29	15.4			
Same plane parallel	1	0.5			
Same plane, random	1	0.5			
Totals	189	100.1			
Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	176	9	4	-	-
Cutting/gouging	173	9	5	2	-
Grinding/polish	12	37	120	20	-
Striations	23	83	77	6	-
Pecks	102	44	35	8	-
Staining	158	10	14	7	-

Table 5.120. Secondary use of undifferentiated polishers.

Type of Use	No.	%
None	37	19.6
Pestle	1	0.5
Hammerstone	129	68.3
Chopper	22	11.6
Totals	189	100.0
Location		
Parallel or angled	1	0.7
Adjacent, non-right	5	3.3
Adjacent, right	81	53.5
Whole artifact	41	27.1
Ends and edges	24	15.8
Totals	152	100.4

Table 5.121. Percentage of polishers in the abrader total.

Site Number	Predominant Time Span	%	Total Number of Abraders
29SJ 299	Basketmaker III - Pueblo I	46	93
29SJ 389	Pueblo III (some Pueblo II)	2	839
29SJ 391	Pueblo III	1	86
29SJ 423	Basketmaker III	62	39
29SJ 627	Pueblo II - Pueblo III	22	500
29SJ 628	Basketmaker III - Pueblo I	23	142
29SJ 629	Pueblo II	13	248
29SJ 633	Pueblo III	2	131
29SJ 721	Pueblo I and Pueblo III	25	4
29SJ 724	Pueblo I	34	23
29SJ 1360	Pueblo II	30	89
29SJ 1659	Basketmaker III	48	19

been in conjunction with the polishing rather than being an actual secondary use.

Comments. A fairly large number of the polishers were found in context; 43 of the 189. The distribution suggests that they were a common household item during Basketmaker III through early Pueblo II. There is a tendency for polishers to represent more of the abrader total in early as opposed to later times. Table 5.121 presents the total number of abraders for each site, as well as the percentages for the undifferentiated polishers, pot polishers, and floor polishers.

Type 41: Probable Pot Polishers

These polishers conformed to my idea of what a pot polisher should look like. Pot polishers are well-used and curated objects. Not only are the faces used, but the edges are used for scraping and show striations (Figure 5.44). The examples shown in Santa Clara Pottery Today (LeFree 1975) suggest that they are small with curved or flat faces and are highly polished. Some of those shown have use facets. Seventy pot polishers were identified (Table 5.122). Sixty-four or 91.4 percent were complete.

Dimensional Variables. Weights and dimensions of pot polishers are presented in Tables 5.123 and 5.124.

Material and Technology. All the pot polishers were made of quartzite. Most were circular, 69 or 98.6 percent, with one that was other-shaped. All had previous forms as cobbles. Manufacture was rare, but two (2.8 percent) were flaked and one (1.4 percent) was abraded. All manufacture was rated light.

Characteristics of the Use Surface. The amount of wear was rated light 27 times (37.1 percent), moderate 43 times (61.4 percent), and heavy once (1.4 percent).

Table 5.122. Site distribution of pot polishers.

Site Number	No.	%
29SJ 299	8	11.4
29SJ 423	5	7.1
29SJ 627	27	38.6
29SJ 628	12	17.1
29SJ 629	4	5.7
29SJ 724	4	5.7
29SJ 1360	6	8.6
29SJ 1659	4	5.7
Totals	70	99.9

A

B

Figure 5.44. *Type 42: pot polishers. A) A possible pot polisher from 29SJ 299, Pithouse D, Structure B (FS 330). B) A possible pot polisher from 29SJ 627, Room 8, Floor 2, contact (FS 5869b). (NPS Chaco Archive Negative Nos. 14256A and 14327B).*

Table 5.123. Weights of pot polishers.

Weight (g)	No.	%	Summary Statistics	
1-19	2	2.9		
20-39	22	31.5		
40-59	18	25.7		
60-79	7	10.0		
80-99	7	10.0		
100-119	5	7.1		
120-139	1	1.4		
637	1	1.4		
Unknown	7	10.0	x̄	62.41 g
			sd	78.72 g
Totals	70	100.0	range	18-637 g

Table 5.124. Dimensions of pot polishers.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
1-2	-	-		
3-4	18	25.7		
5-6	45	64.3		
7-8	3	4.3		
11-12	1	1.4		
Unknown	3	4.3	x̄	5.15 cm
			sd	1.21 cm
Totals	70	100.0	range	3-11 cm
Width				
1-2	1	1.4		
3-4	57	81.5		
5-6	9	12.9		
7-8	1	1.4		
11-12	-	-		
Unknown	2	2.9	x̄	3.90 cm
			sd	0.83 cm
Totals	70	100.1	range	2-8 cm
Thickness				
1	29	41.5		
2	28	40.0		
3	11	15.7		
4	1	1.4		
5	1	1.4	x̄	1.81 cm
Totals	70	100.0	sd	0.86 cm

Table 5.125. Characteristics of the primary use surface of pot polishers.

Area (cm^2)	No.	%	Summary Statistics
1-4	7	10.0	
5-9	23	32.9	
10-14	18	25.7	
15-19	11	15.7	
20-24	5	7.1	
25-29	1	1.4	
30-35	1	1.4	
Unknown	4	5.7	$\bar{x}$ 11.62 cm^2
			sd 6.33 cm^2
Totals	70	99.9	range 3-35 cm^2

Use Surface	Occurrence	%
1	14	20.0
2	47	67.2
3	4	5.7
4	3	4.3
5	2	2.9
Totals	70	100.1

	All Surfaces		Single Surface Only	
Surface Contour	No.	%	No.	%
Flat	13	9.2	1	7.1
Slightly concave	1	0.7	-	-
Slightly convex	28	19.7	6	42.8
Convex	100	70.4	7	50.0
Totals	142	100.0	14	99.9

Type of Use	Absent	Light	Moderate	Heavy
Edge-rounding	67	2	1	-
Cutting/gouging	69	-	-	1
Grinding/polish	3	18	39	10
Striations	6	39	25	-
Pecks	43	21	6	-
Staining	62	2	6	-

Double-use surfaces are the most common followed by single-use surfaces (Table 5.125). Stones with single-use surfaces probably had an unacceptable contour on the opposite face. A total of 142 use surfaces were found on 70 pot polishers, an average of 2.02 per polisher.

Slightly convex and convex surfaces appear to be the most desirable contours for pot polishers. The location of the other use was fairly standard, 56 were opposite, two were on an adjacent non-right-angled edge, and eight on an adjacent right-angled edge. The large faces of the rock were used. This and the kinds of wear (Table 5.125) suggest that another tool was used for the scraping and shaping of the vessels.

Secondary Use. Even though the pot polishers tend to be quite small, 50 or 71.4 percent were used as hammerstones and five (7.1 percent) as choppers. The amount of this use varies, 36 (65.5 percent) were light, 17 (30.95 percent) were moderate, and two (3.6 percent) were heavily used. The location of this use was most often on an adjacent right-angled edge, 34 times (61.8 percent), with 12 (21.8 percent) utilizing the whole artifact, and nine (16.4 percent) on the ends and edges.

<u>Comments.</u> Considering that a large amount of the pottery found at Chaco Canyon was manufactured outside of the canyon (Toll, Chapter 2 of this volume), it is interesting that only Pueblo Alto and Una Vida did not have pot polishers. Those found are associated with the earlier sites and earlier areas of the later sites.

Pot polishers are generally identified by their size and the fact that they are river cobbles. Judd (1954:125) noted that "the water worn pebbles with which Pueblo women traditionally gloss the surfaces of earthenware vessels prior to ornamentation and firing were little used at Pueblo Bonito." Only 11 pebbles showing perceptible wear were found at Pueblo Bonito, along with one from Pueblo del Arroyo. Vivian and Mathews (1965:94) report that "thirteen small pebbles showing unusual polishing or faceting" were found at Kin Kletso. The maximum dimensions of these ranged from 3.49 to 6.67 cm (1 3/8 to 2 5/8 inches) and the materials were water-worn pebbles of silicified wood, chalcedony, and quartzite.

Woodbury (in Kluckhohn and Reiter 1939) considered 14 of the utilized river cobbles from Bc 50 and 51 to be pot polishers. None were faceted but many were highly polished. The typical size was 4.76 by 0.95 cm (1 7/8 by 3/8 inches). Material types included two quartzites and one petrified wood. There were also seven specimens that he could not definitely assign to either the pot polisher or plaster smoothing category. Bradley (1971) reported two pot polishers from Bc 236, both flat oblong cobbles of yellowish quartzite, highly polished but with no faceting. The largest had a diameter of 5.715 cm (2 1/4 inches).

Pot polishers were more commonly found at Mesa Verde. Hayes (1975) describes them as small polishers averaging 4-to-5-cm in diameter, weighing around 35 g, and having smooth dense surfaces. He suggested that those with convex surfaces were used for polishing vessel surfaces. Fifty-five of these were found from the La Plata phase, 29 from the Piedra phase, and 22 from Badger House from the Ackmen through Mesa Verde phases.

Woodbury, in his report for the Awatovi Expedition, referred to these as polishing pebbles "which show one or more nearly flat surfaces worn artificially, either finely striated or polished" (Woodbury 1954:96). About one-quarter of those he studied also had scarring from hammerstone use. Nearly all were quartzite and ranged from 2-to-7-cm-long with a mean of 4.2 cm.

<u>Type 42: Large Polishers</u>

This group consists of large polishers, too large for use in pottery making. They are generally believed to have been used for applying plaster to the floors and walls of structures (Figures 5.45-5.47). Sixty-three were found in our excavations (Table 5.126), 53 or 81.5 percent were complete.

Table 5.126. Site distribution of large polishers.

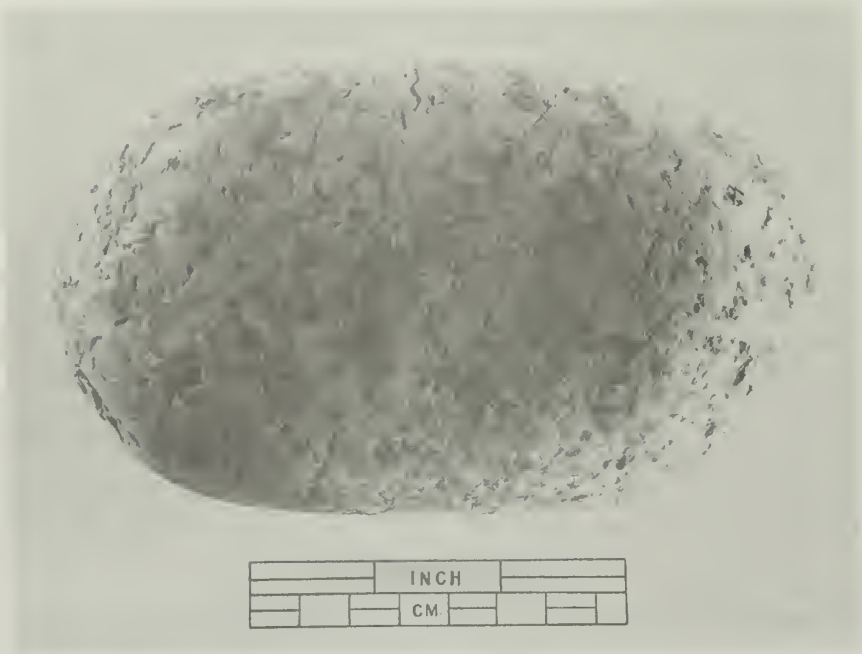
Site Number	No.	%
29SJ 299	22	34.9
29SJ 389	2	3.2
29SJ 391	1	1.6
29SJ 423	4	6.1
29SJ 627	23	36.5
29SJ 628	4	6.4
29SJ 629	3	4.8
29SJ 1360	3	4.8
29SJ 1659	1	1.6
Totals	63	99.9

Note: Figures in tables could not be verified; errors may exist.

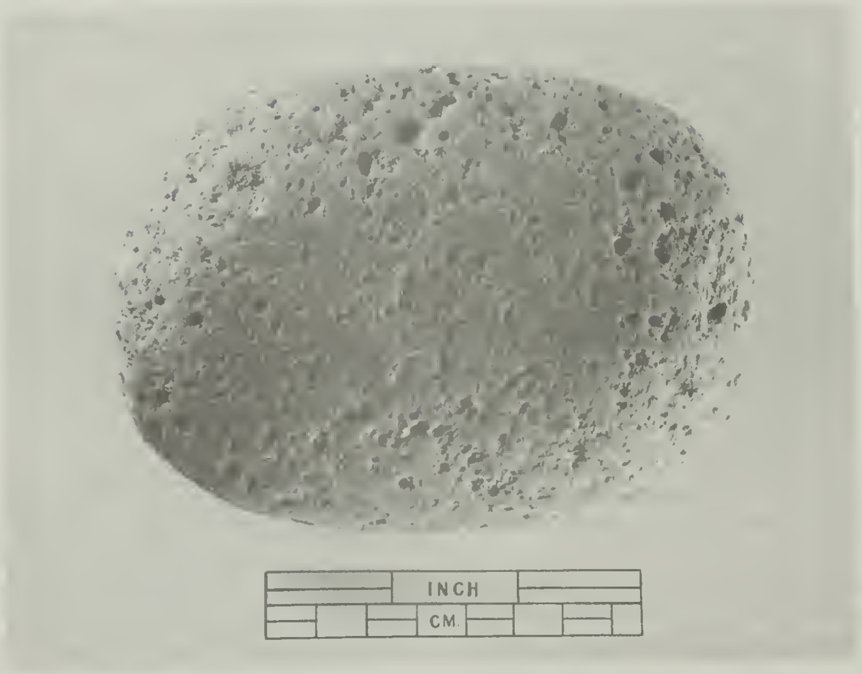
<u>Dimensional Variables.</u> The sizes of the polishers cluster fairly well with lengths of 7-to-14-cm, widths 7-to-10-cm and thicknesses of 4-to-6-cm (Tables 5.127 and 5.128). This would be a good hand size.

<u>Materials and Technology.</u> Materials are given in Table 5.129. The plan view was generally circular for 55 or 87.3 percent of the large polishers. Six were other-shaped (9.5 percent) and two were unknown. Previous forms were river cobbles except for one concretion and one natural. The manufacture was minimal. Fifty-eight (92.1 percent) had none, one was pecked, one was flaked and abraded, and three were pecked and abraded. They were rated light twice and moderate three times (Table 5.130).

<u>Characteristics of the Use Surface.</u> Twenty to sixty cm^2 seems to be the optimal surface area for the

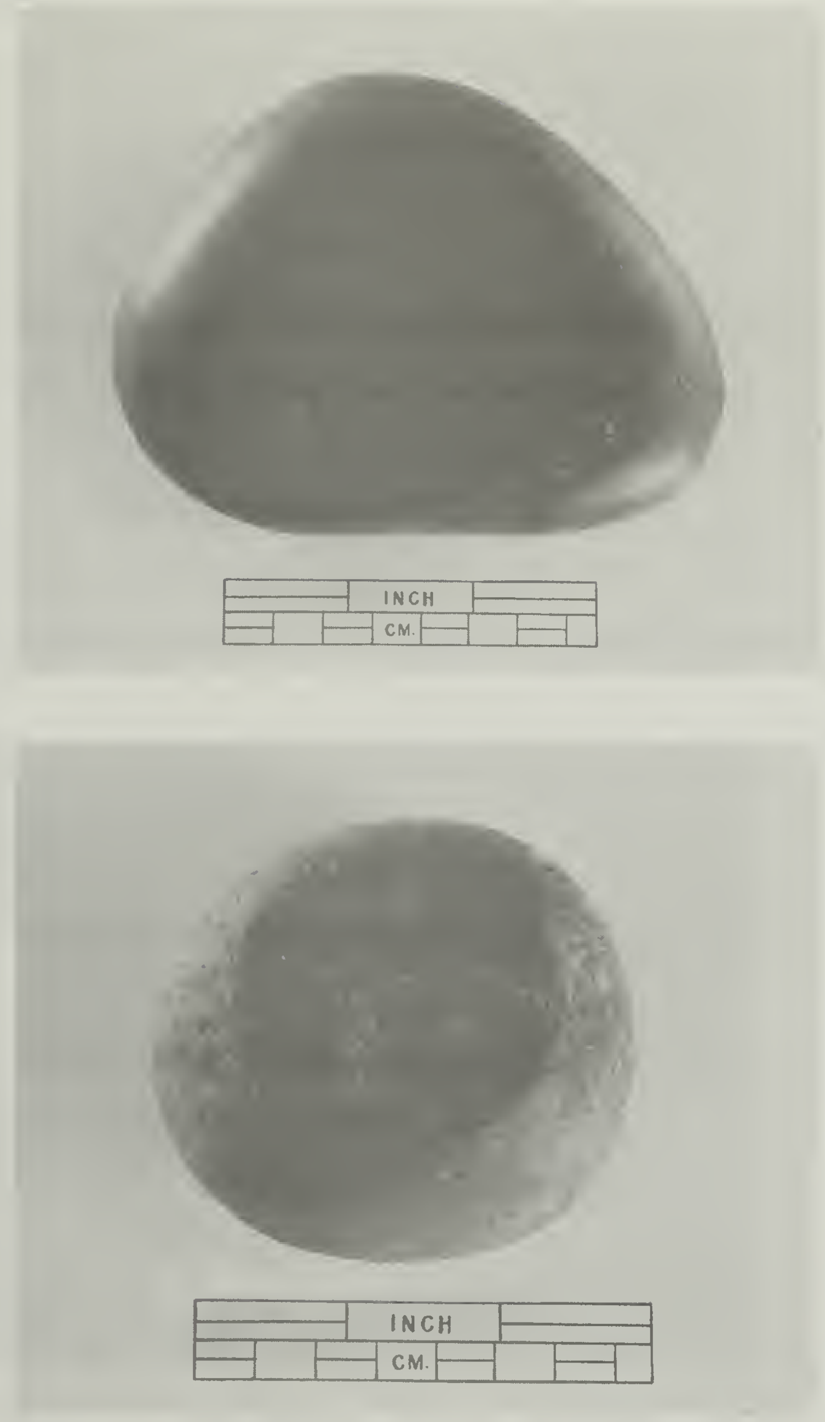


A



B

Figure 5.45. *Type 42: large polishers. A) A large polisher from 29SJ 299, Pithouse A, Bin B, Floor contact (FS 142). B) A large polisher from 29SJ 299, Pithouse A, Stratum B (FS 102). (NPS Chaco Archive Negative Nos. 14232B and 14319B).*

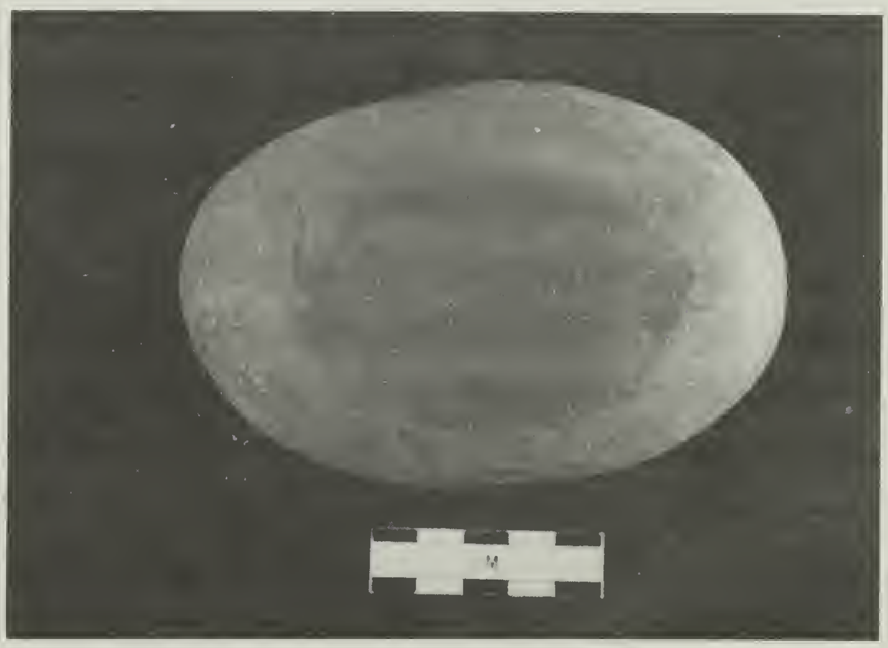


A

B

Figure 5.46. *Type 42: large polishers. A) A large polisher from 29SJ 1360, Kiva B, Bench (FS 732). B) A large polisher from 29SJ 1360, Kiva A, Fill (FS 256). (NPS Chaco Archive Negative Nos. 14323D and 14269B).*

A



B

Figure 5.47. *Type 42: large polishers. A) A large polisher from 29SJ 627, Room 5, Floor 2 (FS 4264). B) A large polisher from 29SJ 391, Room 18, near floor (C 2084). (NPS Chaco Archive Negative Nos. 14326B and 18316).*

Table 5.127. Weights of large polishers.

Weight (g)	No.	%	Summary Statistics	
1-299	3	4.8		
300-499	12	19.2		
500-699	13	20.8		
700-899	9	14.4		
900-1099	4	6.4		
1100-1299	4	6.4		
1700-1899	3	4.8		
2000+	4	6.4		
Unknown	11	17.5	x̄	837.92 g
			sd	533.36 g
Totals	63	100.7	range	206-2,359 g

Table 5.128. Dimensions of large polishers.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
7-8	7	11.1		
9-10	16	25.4		
11-12	14	22.2		
13-14	12	19.0		
15-16	3	4.8		
17-18	3	4.8		
19-20	1	1.6		
Unknown	7	11.1	x̄	11.55 cm
			sd	2.79 cm
Totals	63	100.0	range	7-19 cm
Width				
5-6	3	4.8		
7-8	23	36.5		
9-10	23	36.5		
11-12	6	9.5		
13-14	1	1.6		
Unknown	7	11.2	x̄	8.75 cm
			sd	1.55 cm
Totals	63	100.1	range	6-13 cm
Thickness				
1-2	1	1.6		
3-4	22	34.9		
5-6	27	42.9		
7-8	10	15.9		
9-10	1	1.6		
Unknown	2	3.2	x̄	5.09 cm
			sd	1.57 cm
Totals	63	100.1	range	2-9 cm

Table 5.129. Materials of large polishers.

Material	No.	%
Medium sandstone	1	1.6
Hard sandstone	1	1.6
Very hard sandstone	2	3.2
Metamorphic	3	4.8
Granite	7	11.1
Igneous	7	11.1
Quartzite	42	66.7
Totals	63	100.1

Table 5.130. Characteristics of the primary use surface of large polishers.

Amount of Use	No.	%	Summary Statistics	
Light	7	11.1		
Moderate	49	77.8		
Heavy	6	9.5		
Unknown	1	1.6		
Totals	63	100.0		
Area (cm^2)				
1-19	3	4.8		
20-39	24	38.1		
40-59	16	25.4		
60-79	6	9.5		
80-99	4	6.3		
100-119	1	1.6		
Unknown	9	14.3	$\bar{x}$	44.17 cm^2
			sd	21.13 cm^2
Totals	63	100.0	range	15-100 cm^2
Use Surface	Occurrences	%		
1	8	12.7		
2	40	63.5		
3	10	15.9		
4	2	3.2		
5	1	1.6		
6	1	1.6		
7	1	1.6		
Totals	63	100.1		

Table 5.131. Other characteristics of primary use surfaces of large polishers.

Surface Contour	No.	%
Irregular	2	1.4
Flat	2	1.4
Slightly concave	1	0.7
Concave	1	0.7
Slightly convex	25	17.4
Convex	113	78.5
Totals	144	100.1

Types of Use	Absent	Light	Moderate	Heavy
Edge-rounding	61	2	-	-
Cutting/grouging	36	13	9	5
Grinding/polish	-	4	46	13
Striations	6	18	39	-
Pecks	20	16	24	3
Staining	43	11	9	-

large polishers (Table 5.130). One hundred and forty-four use surfaces were recorded for the 63 large polishers, an average of 2.3 per polisher.

One to three surfaces account for most of the large polishers (Table 5.130). Convex surfaces were the most preferred (Table 5.131). Surface locations included 59 opposites, 15 adjacent non-right-angled, and nine adjacent right-angled surfaces. Table 5.131 indicates other use wear.

Secondary Use. Secondary use occurred in most of the cases; 49 or 77.8 percent of the large polishers were also used as hammerstones and seven or 11.1 percent as choppers. The other seven were unknown. Use was rated light 12 times (26.2 percent), moderate 34 times (74.1 percent), and heavy ten times (21.8 percent). The locations of usage included two on an adjacent non-right-angled edge, 18 on an adjacent right-angled edge, 32 utilized the whole artifact, and four were on ends and edges.

Comments. Judd (1954) referred to these as "rubbing and smoothing stones" and stated that they "are commonly thought to have been utilized for smoothing earthen floors and newly plastered walls. They would have answered these purposes admirably, but none of our examples show the transverse striations that must have resulted had it been so employed" (Judd 1954:125). Most of his series were double-sided with the faces being flat or slightly convex and made of water-worn sandstone cobbles, except for three that were vesicular lava and two which were an igneous rock called gabbro. Judd noted that these were frequently substituted for other household implements as shown by their battered edges. No numbers were given.

None were reported for Kin Kletso, Bc 236, or specified for Łeyit Kin. Woodbury (in Kluckhohn and Reiter 1939) lists three "rubbing stones" from Bc 51 that were "round, flat objects which are usually said to be employed in smoothing plaster floors and walls." A note made by Paul Reiter states that:

> the function is one of smoothing and compressing—actually annealing is also part of the process. The weight, resulting from the large size of the artifact, is most important; beside smoothing the wet plaster put on a wall, it served to mix and agitate the plaster, equalling distribution of the density, removing bubbles. Surface agitation also mixes the wet plaster to the point where it is consistently impressed and cracking is avoided (Kluckhohn and Reiter 1939:61).

For the Mesa Verde area, Rohn (1971) called these "rubbing stones" and recorded four of them up to 16 cm in diameter. Hayes (1975) stated that they average 10 cm in diameter and 300 g in weight. Most had some shaping by pecking with one or two polished faces and occasional additional use on the ends or edges. Sixty were reported from his study; only six of these were from Badger House and all of those from the trash area. Chaco Canyon is not the only area where the use of polishers decreased from Basketmaker times.

Type 43: Broken Edge Polishers

These unusual artifacts consist of a broken cobble with the edge ground down on a portion of or the entire edge of the break. This is usually at an adjacent non-right-angle to either surface. The rest of the rock may or may not have been used in any kind of grinding. Thirteen of these were found (Table 5.132), ten or 76.9 percent were complete.

Table 5.132. Site distribution of edge polishers.

Site Number	No.	%
29SJ 299	1	7.7
29SJ 627	6	46.2
29SJ 628	2	15.4
29SJ 629	2	15.4
29SJ 724	1	7.7
29SJ 1360	1	7.7
Totals	13	100.1

Dimensional Variables. Weights and dimensions for edge polishers are given in Tables 5.133 and 5.134. Although the sample size is small there is a tendency toward small hand-held cobbles.

Material and Technology. One was made from a metamorphic cobble and the rest are quartzite. Nine (69.2 percent) were circular in plan view and four were other-shaped. Only two had any manufacture—light flaking.

Characteristics of the Use Surface. Two (15.4 percent) were used lightly and the remaining 11 had moderate use (84.6 percent). The area of the use surfaces was relatively small (Table 5.135). Thirty-six use surfaces were found for the 13 edge polishers (Table 5.135). This is an average of 2.7 surfaces per polisher.

Four of the surfaces were flat (11.2 percent). Six were slightly convex (16.8 percent) and 26 were convex (72.8 percent). These surfaces were located on an opposite face 12 times on an adjacent non-right-angle eight times and a right angle three times. Types of other use are given in Table 5.135.

Secondary Use. Two of the edge polishers did not have a secondary use. One was also used as a pestle-cornbreaker, nine as hammerstones (69.2 percent), and one as a chopper. This use was rated light twice, moderate seven times, and heavy two times.

Comments. The distribution within sites was not helpful in determining how the edge polishers were used. They are somewhat restricted in time; all are Basketmaker III to Pueblo I, with a few into Pueblo II.

No mention of broken edge polishers was found in the literature. It is quite likely that these are usually classified as hammerstones. Woodbury (1954:Figure 19) pictures a very similar object but calls it a paint grinding stone. Only one of our sample had any staining, suggesting that paint grinding was not a consistent use of the edge polishers.

Type 44: "Lightning Stones"

Two lightning stones were recovered from Chaco Canyon (Figure 5.48). These came from the excavations of R. Gordon Vivian at Una Vida in 1960. Both of these were from the floor of Room 23 or Room 64 and are complete.

Dimensional Variables. Table 5.136 presents the dimensions for the lightning stones.

Material and Technology. Both were cylindrical-shaped and made of quartz cobbles. Manufacture was heavy abrasion for both. The wear was moderate. Surfaces continued around the stone with no breaks or facets so the whole surface was measured, giving surface areas of 162 and 190 cm^2. The average was 176 and the standard deviation was 19.7. The surface contours were always convex. One had three use surfaces and the other had six. This included three opposites, two at right angles, and two parallel on the same plane. Heavy grinding and striations were recorded for both.

Secondary Wear. No secondary wear was observed.

Table 5.133. Weights of complete edge polishers.[a]

Weight (g)	No.	%	Summary Statistics	
50-99	2	15.4		
100-149	2	15.4		
150-199	3	23.1		
200-249	2	15.4		
250-299	1	7.7	$\bar{x}$	171.20 g
			sd	63.73 g
Totals	10	77.7	range	74-290 g

[a] Three incomplete edge polishers not included.

Table 5.134. Dimensions of edge polishers.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
3-4	2	15.4		
5-6	6	46.2		
7-8	2	15.4		
Unknown	3	23.1	$\bar{x}$	5.90 cm
			sd	1.19 cm
Totals	13	100.1	range	4-8 cm
Width				
3-4	3	23.1		
5-6	6	46.2		
7-8	3	23.1		
Unknown	1	7.7	$\bar{x}$	5.42 cm
			sd	1.44 cm
Totals	13	100.1	range	3-8 cm
Thickness				
3-4	9	69.3		
5-6	3	23.1		
Unknown	1	7.7	$\bar{x}$	4.00 cm
			sd	0.74 cm
Totals	13	100.1	range	3-5 cm

Table 5.135. Characteristics of the primary use surface of edge polishers.

Area (cm^2)	No.	%	Summary Statistics	
1-2	2	15.4		
3-4	1	7.7		
7-8	3	23.1		
15-16	2	15.4		
31	1	7.7		
Unknown	4	30.8	$\bar{x}$	10.11 cm^2
			sd	9.28 cm^2
Totals	13	100.1	range	1-31 cm^2

Use Surface	Occurrences	%
1	2	15.4
2	3	23.1
3	6	46.2
5	2	15.4
Totals	13	100.1

Type of Use	Absent	Light	Moderate	Heavy
Edge-rounding	8	4	-	1
Cutting/gouging	12	1	-	-
Grinding/polish	-	-	10	3
Striations	2	6	5	-
Pecking	6	1	6	-
Staining	11	2	-	-

Table 5.136. Dimensions of lightning stones.

Catalog Number	Weight	Length	Width	Thickness
C2316	577	10	6	6
C2317	777	11	7	7
$\bar{x}$	677	10.5	6.5	6.5
sd	141.42	0.7	0.7	0.7

Table 5.137. Anvils.

Measure	Anvil-Passive Abrader	Anvil-Abrader
Sample size	246	35
Number complete	178	33
Percent complete	72.4	94.3
Mean weight	2,307.3	754.4
Mean length	18.7	13.7
Mean width	13.3	9.8
Mean thickness	4.5	3.2
Mean surface area	144.1	88.1

Table 5.138. Site distribution of undifferentiated anvils.

Site Number	No.	%
29SJ 299	14	5.7
29SJ 389	79	32.1
29SJ 390	1	0.4
29SJ 391	7	2.8
29SJ 423	2	0.8
29SJ 627	65	26.4
29SJ 628	17	6.9
29SJ 629	24	9.8
29SJ 633	17	6.9
29SJ 721	3	1.2
29SJ 724	5	2.0
29SJ 1360	8	3.3
29SJ 1659	4	1.6
Totals	246	99.9

A

B

Figure 5.48. *Type 44: "lightning stones." A) A lightning stone from 29SJ 391, Room 23 (or Room 64), Floor contact (C 2128). B) Another lightning stone from 29SJ 391, Room 23 (or Room 64), Floor contact (C 2129). (NPS Chaco Archive Negative Nos. 18326 and 18327).*

Comments. The literature search did not reveal any other "lightning stones" from sites in Chaco Canyon or Mesa Verde. Woodbury (1954) did not report any from northeastern Arizona. This occurrence is certainly unique for the area and possibly the time period involved.

Anvils

Anvils are not formalized tools. They consist of almost anything that was used for that purpose and are often combined with other functions. Active or passive abraders that also display primary abrader functions have already been described as Type 19: Abrader-anvils. Artifacts that had their primary function as anvils are described here (Table 5.137); they are divided into an undifferentiated class and a class where opposite faces were active abraders.

Type 50: Undifferentiated Anvils

This is the third largest abrader group in the Chaco Canyon sample (Table 5.138). Anvils are objects that have been used as work surfaces for various tasks and the wear is produced by cutting and gouging or pecking (Figures 5.49-5.51). Two hundred and forty-six were analyzed, 178 or 72.4 percent were complete.

Dimensional Variables. The size of anvils varies greatly (Tables 5.139 and 5.140); they range from hand-held to immobile masses.

Materials and Technology. Harder materials were selected for anvils (Table 5.141). Rectilinear shapes account for almost half of the sample and previous forms are common (Table 5.142). Most had some modification before functioning as anvils (Table 5.143).

Characteristics of the Use Surface. The degree of primary wear was rated light 93 times (37.8 percent), moderate 147 times (59.8 percent), heavy twice (0.8 percent) and was unknown four times.

The wide range of surface areas was as expected for an undifferentiated group such as this (Table 5.144). The number of use surfaces ranged from one to six but was usually single or double. Four hundred use surfaces were found, an average of 1.6 per anvil.

Table 5.144 suggests that there is either no optimal surface contour for anvils, although flat and slightly concave are sometimes preferred, or that functional differences within the anvils are reflected in the surface contour.

The location of the other use surfaces is not very complex given the sample size. When more than one surface was found, opposites were by far the most common; 134 opposites were found. Three surfaces were located on an adjacent non-right-angled surface, eight on adjacent right-angled surfaces, one on the same surface parallel, and two on the same face random. Any kind of wear can be expected on anvils, attesting to their multifunctional character (Table 5.144).

Secondary Use of Anvils. The secondary use was varied and common (Table 5.145). This was rated light 43 times (40.0 percent), moderate 63 times (58.6 percent); and heavy twice (1.9 percent).

Comments. Anvils occur in all sites in percentages ranging from five to 15 in sites with a fair sample size. Because they are numerous, undifferentiated, and their functions diverse, no attempt was made to look at them in context.

The only use of the term, " anvil," found in the literature reviewed was by Rohn (1971) for Mug House. The specimen he pictured and described, however, would have fallen into the passive abrader-anvil group in this analysis.

Type 52: Anvil-abraders

This group consists of tools that had an anvil use on one face and an active abrader use on the opposite face. This was possibly the result of an activity that required both kinds of surface (Figure 5.52). Thirty-five anvil-abraders were analyzed (Table 5.146); 33 or 94.3 percent were complete.

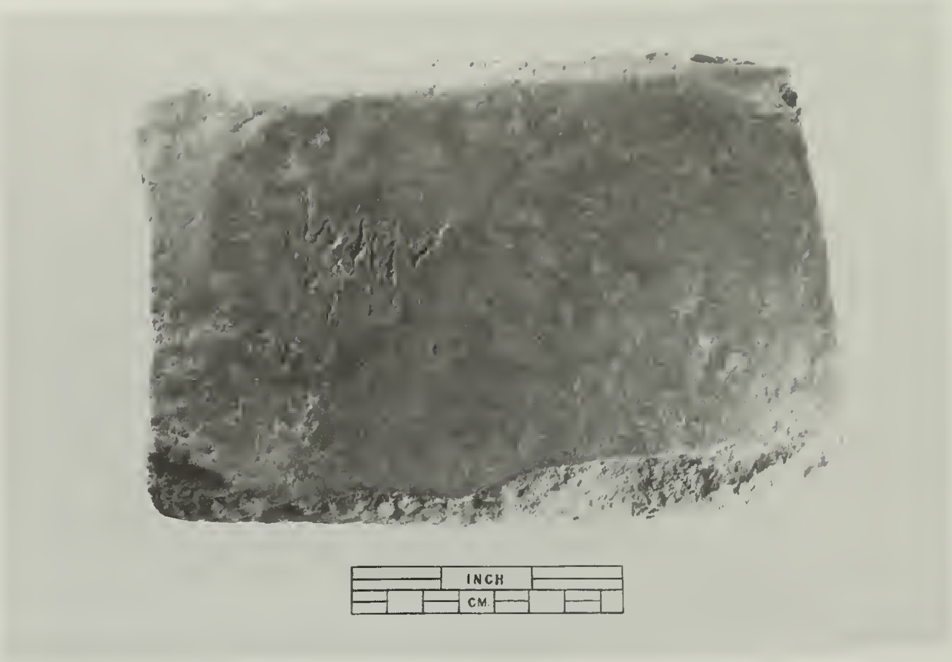
Dimensional Variables. The weights and measurements (Tables 5.147 and 5.148) show a tendency toward a tool which would have been used with two hands and which was a little thicker than most active abraders.

Material and Technology. All of the anvil-abraders were made of fine-grained sandstones. One was soft, one was medium, 15 were hard (42.9

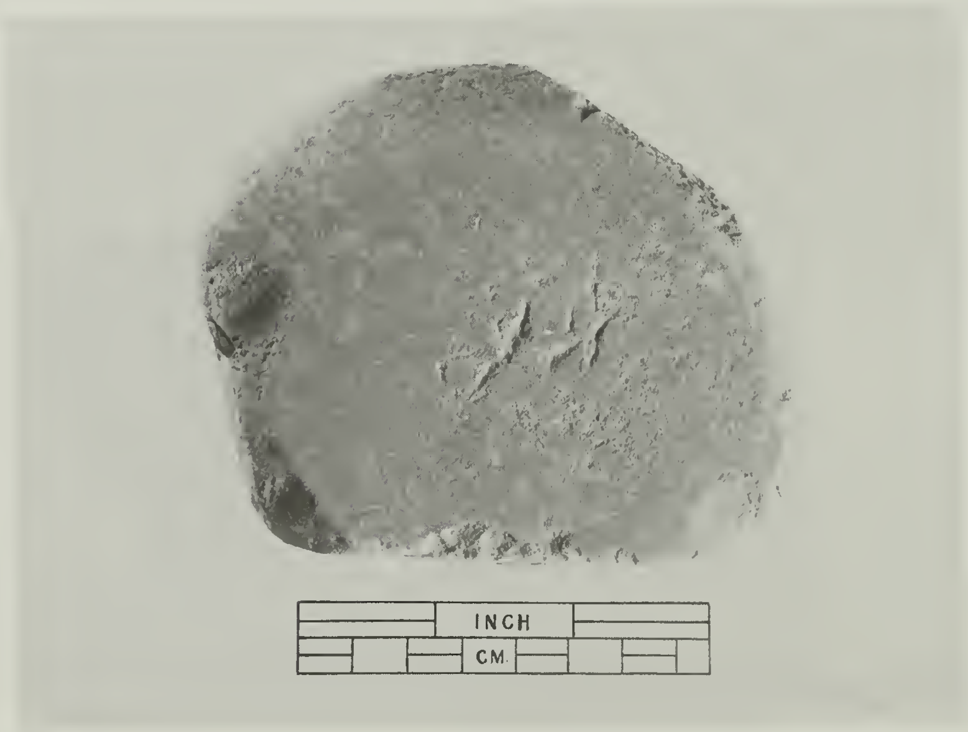
A

B

Figure 5.49. *Type 50: undifferentiated anvils. A) An anvil made from a large cobble: 29SJ 299, Pithouse A, Bin A, Floor contact (FS 128). B) An anvil from 29SJ 299, Pithouse B, Stratum A (FS 285). (NPS Chaco Archive Negative Nos. 14286A and 14299B).*



A



B

Figure 5.50. *Type 50: undifferentiated anvils. A) An anvil from 29SJ 627, Room 5, Floor contact (FS 431). B) An anvil made from a mano fragment: 29SJ 1360, House I, Area III, Upper Surface (FS 164). (NPS Chaco Archive Negative Nos. 14235B and 14255A).*

Figure 5.51. *An undifferentiated anvil from 29SJ 389, Room 103, Layer 2, Level 4 (FS 1150). (NPS Chaco Archive Negative No. 16063C).*

Table 5.139. *Weights of undifferentiated anvils.*

Weight (g)	No.	%	Summary Statistics	
1-499	12	4.9		
500-999	37	15.0		
1000-1499	34	13.8		
1500-1999	28	11.4		
2000-2499	19	7.8		
2500-2999	16	6.5		
3000-3499	8	3.3		
3500-3999	9	3.7		
4000-5999	8	3.3		
6000-9999	2	0.8		
10,000+	5	2.0		
Unknown	68	27.6	$\bar{x}$	2,307.28 g
			sd	3,045.03 g
Totals	246	100.1	range	114-2,8000 g

Table 5.140. Dimensions of undifferentiated anvils.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
1-9	2	0.8		
10-19	110	44.8		
20-29	62	25.2		
30-39	4	1.6		
40-49	3	1.2		
50-59	1	0.4		
Unknown	64	26.0	x̄	18.69 cm
			sd	6.73 cm
Totals	246	100.0	range	6-51cm
Width				
1-9	28	11.4		
10-19	174	70.7		
20-29	8	3.3		
30-39	6	2.4		
Unknown	30	12.2	x̄	13.31 cm
			sd	4.76 cm
Totals	246	100.0	range	4-37 cm
Thickness				
1-2	29	11.8		
3-4	113	46.0		
5-6	64	26.0		
7-8	21	8.5		
9-10	5	2.0		
11-12	3	1.2		
13-14	1	0.4		
15-16	1	0.4		
Unknown	9	3.7	x̄	4.50 cm
			sd	2.10 cm
Totals	246	100.0	range	1-16 cm

Table 5.141. Weights of pigment abraders.

Weight (g)	No.	%	Summary Statistics	
1-99	4	24.6		
100-199	6	37.8		
200-299	3	18.9		
300-399	1	6.3		
800-899	1	6.3		
900-999	1	6.3	x̄	256.37 g
			sd	254.46 g
Totals	16	100.2	range	10-907 g

Table 5.142. Shapes of undifferentiated anvils.

Plan View	No.	%
Rectilinear	106	43.1
Circular	37	15.0
Other	70	28.5
Unknown	33	13.4
Totals	246	100.0
Previous Form		
None	113	45.9
Concretion	17	6.9
River cobble	10	4.1
Mano	30	12.2
Metate	13	5.3
Slab cover	3	1.2
Anvil	1	0.4
Other	6	2.4
Unknown	53	21.5
Totals	246	99.9

Table 5.143. Manufacture of undifferentiated anvils.

Type of Manufacture	No.	%
None	50	20.3
Flaked	47	19.1
Abraded	17	6.9
Pecked	8	3.3
Flaked and abraded	57	23.2
Pecked and flaked	11	4.5
Pecked and abraded	17	6.9
Pecked, flaked and abraded	28	11.4
Unknown	11	4.5
Totals	246	100.1
Amount of Work Invested		
None	50	20.3
Light	73	29.7
Moderate	103	41.9
Heavy	4	1.6
Unknown	16	6.5
Totals	246	100.0

Table 5.144. Characteristics of the primary use surface of undifferentiated anvils.

Area (cm^2)	No.	%	Summary Statistics	
1-49	18	7.3		
50-99	44	17.9		
100-149	‘57	23.2		
150-199	27	11.0		
200-249	17	6.9		
250-299	6	2.4		
300-399	4	1.6		
400-499	2	0.8		
500+	6	2.4		
Unknown	65	26.4	$\bar{x}$	144.11 cm^2
Totals	246	99.9	sd	110.52 cm^2
			range	3-775 cm^2

Use Surface	No.	%
1	107	43.5
2	129	52.4
3	7	2.8
4	2	0.8
6	1	0.4
Totals	246	99.9

	All Surfaces		Single Surface Only	
Surface Contour	No.	%	No.	%
Irregular	78	19.5	14	13.1
Flat	112	28.0	33	30.8
Slightly concave	77	19.2	30	28.0
Concave	16	4.0	4	3.8
Slightly convex	59	14.7	16	15.0
Convex	58	14.5	10	9.3
Totals	400	99.9	107	100.0

Type of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	94	106	44	1	1
Gutting/gouging	-	-	-	-	246
Grinding/polish	4	9	233	-	-
Striations	66	102	78	-	-
Pecks	135	1	1	1	108
Staining	218	11	14	3	-
Other	245	-	1	-	-

Table 5.145. Secondary use on undifferentiated anvils.

Type of Use	No.	%
None	52	21.1
Mano	3	1.2
Active abrader	3	1.2
Palette	1	0.4
Grooved abrader	1	0.4
Polishing stone	1	0.4
Hammerstone	12	4.9
Chopper	78	31.7
Pot lid	1	0.4
Manolike slab	5	2.0
Architectural slab	1	0.4
Other-shaped stone	1	0.4
Other	1	0.4
Unknown	86	35.0
Totals	246	99.9
Location of Use		
Opposite or angled	5	4.6
Adjacent, non-right	1	0.9
Adjacent, right	87	79.8
Corner	5	4.6
Same plane	4	3.7
Whole artifact	4	3.7
Ends and edges	3	2.8
Totals	109	100.1

Table 5.146. Site distribution of anvil-abraders.

Site Number	No.	%
29SJ 389	12	34.3
29SJ 627	13	37.1
29SJ 628	2	5.7
29SJ 629	3	8.6
29SJ 633	3	8.6
29SJ 1360	2	5.7
Totals	35	100.0

percent), and 18 were very hard (51.4 percent). The plan view tended to be rectilinear, 15 or 42.9 percent, with seven circular (20.0 percent), 11 other (31.4 percent), and two unknown. The previous form was quite often a mano, 23 times or 65.7 percent. Three had no previous forms, another three had "other" recorded, and six were unknown.

The manufacturing techniques (Table 5.149) were rated light three times and moderate 19 times. Considering that over half of these were previously used as manos, there was a fair amount of manufacture necessary to prepare them for an anvil-abrader function.

Characteristics of the Use Surface. The degree of wear was light seven times (20.0 percent), moderate 27 times (77.7 percent), and heavy once (2.9 percent).

By definition, all of these should have two use surfaces. Twenty-seven had only two surfaces (72.2 percent) while two had three; four, five, and seven use surfaces were recorded once each. There were three that were described as having a single-use surface, these are most likely coding errors and should have been included in the Type 19 abrader-anvil group. A total of 79 surfaces were recorded for the 35 anvil-abraders, a mean of 2.2 per artifact. Use surfaces varied with flat, slightly convex and convex the most common (Table 5.150).

Thirty-one of these surfaces were located opposite the primary use surface, one on an adjacent non-right-angled edge, and ten on adjacent right-angled edges. The ten located on adjacent right-angled edges represent only three anvil-abraders with two, three, and five use surfaces.

Secondary Use. Secondary use was found in about half of the cases. Eleven had none (31.4 percent), one was used as a grooved abrader, one as a hammerstone, 16 as choppers (45.7 percent), and six were unknown. Secondary wear was recorded as light eight times and moderate ten times. It was located on an adjacent right-angled edge 17 times (95.2 percent) and once on the same plane.

Comments. Seven of the thirty-five anvil-abraders were found in primary context in habitation structures and on ramada surfaces. They occur in low percentages of the abrader totals, from one to three percent at the sites in which they were found. No mention of similar objects was found in the literature reviewed.

General Site Information

Cross tabulations were run on all of the abraders as one file and every variable was cross tabulated with the site number variable to see if there was patterning. The following information is based

A

B

Figure 5.52. *Type 52: anvil-abraders. A) The abrader face of anvil-abrader from 29SJ 627, Room 7, Floor 2, Contact (FS 4106). B) The anvil face of a fossiliferous sandstone anvil-abrader from 29SJ 633, Room 7, Rock Concentration 2 (FS 741). (NPS Chaco Archive Negative Nos. 14324B and 18278).*

Table 5.147. Weights of anvil-abraders.

Weight (g)	No.	%	Summary Statistics	
200-299	4	11.4		
300-399	5	14.3		
400-499	5	14.3		
500-599	6	17.2		
600-699	1	2.9		
700-799	2	5.7		
800-899	1	2.9		
900-999	2	5.7		
1000-1999	4	11.4		
2000+	3	8.6		
Unknown	2	5.7	x̄	754.36 g
			sd	551.24 g
Totals	35	100.1	range	201-2,215 g

Table 5.148. Dimensions of anvil-abraders.

Dimensions (cm)	No.	%	Summary Statistics	
Length				
5-9	4	11.4		
10-14	19	54.3		
15-19	5	14.3		
20-24	4	11.4		
25-29	1	2.9		
Unknown	2	5.7	x̄	13.67 cm
			sd	4.68 cm
Totals	35	100.0	range	7-26 cm
Width				
5-6	2	5.7		
7-8	10	28.6		
9-10	8	22.9		
11-12	11	31.4		
13-14	3	8.6		
Unknown	1	2.9	x̄	9.76 cm
			sd	2.14 cm
Totals	35	100.1	range	6-14 cm
Thickness				
1	1	2.9		
2	8	22.9		
3	13	37.1		
4	10	28.6		
5	2	5.7		
7	1	2.9	x̄	3.23 cm
			sd	1.14 cm
Totals	35	100.1	range	1-7 cm

Table 5.149. Manufacture of anvil-abraders.

Type of Manufacture	No.	%
None	13	37.1
Flaked	3	8.6
Flaked and abraded	5	14.3
Pecked and flaked	5	14.3
Pecked and abraded	1	2.9
Pecked, flaked and abraded	8	22.9
Totals	35	100.1

Table 5.150. Characteristics of the primary use surface of anvil-abraders.

Area (cm^2)	No.	%	Summary Statistics	
25-49	8	22.9		
50-99	15	42.9		
100-149	5	14.3		
150-199	2	5.7		
200-249	3	8.6		
Unknown	2	5.7	$\bar{x}$	88.12 cm^2
			sd	52.48 cm^2
Totals	35	100.1	range	25-210 cm^2

Surface Contour	No.	%
Irregular	11	14.0
Flat	19	24.1
Slightly concave	6	7.6
Slightly convex	21	26.6
Convex	22	27.9
Totals	79	100.2

Types of Use	Absent	Light	Medium	Heavy	Characteristic
Edge-rounding	14	13	8	-	-
Cutting/gouging	3	-	-	-	32
Grinding/polish	-	-	-	-	35
Striations	1	6	28	-	-
Pecks	21	2	12	-	-
Staining	30	3	1	1	-

Table 5.151. Condition of the artifact in percentages.

Site Number	Complete	Broken	Fragmentary
29SJ 423	66.7	17.9	15.4
29SJ 1659	57.9	26.3	15.8
29SJ 299	86.0	11.8	2.2
29SJ 628	73.2	15.5	11.3
29SJ 721	75.0	25.0	-
29SJ 724	60.9	21.7	17.4
29SJ 1360	84.3	12.4	3.4
29SJ 629	71.4	15.3	13.3
29SJ 627	75.6	21.2	3.2
29SJ 389	65.2	17.2	17.6
29SJ 390	33.3	33.3	33.3
29SJ 391	83.7	10.5	5.8
29SJ 633	93.1	6.1	0.8

on those computer runs, and it will be used to evaluate each site in relation to the others. The tables in this section are arranged in rough chronological sequence with sites at the top of the list being the earliest and those at the bottom the latest.

Naturally, the distribution of abrader types has an effect on condition of the artifact. The hardness and durability of the material, the duration and intensity of use, and the amount of effort put into the abrader are also factors. The trends that are most evident from Table 5.151 are mostly related to the temporal placement of the site. Those with the smaller percentage of completed abraders are generally the earlier sites—Basketmaker III and Pueblo I in time—while the latest site in the sample has the largest percentage. There are exceptions; 29SJ 299 had two structures catastrophically abandoned, and this may account for the large percentage of complete abraders from that site. At 29SJ 389 literally anything that could have been an abrader was sent in for analysis. With the exceptions of 29SJ 423 and 29SJ 1659, there was more burning found in the earlier sites (Table 5.152).

Table 5.152. Burning of abraders.

Site Number	%
29SJ 423	12.8
29SJ 1659	10.5
29SJ 299	39.9
29SJ 628	31.0
29SJ 721	50.0
29SJ 724	30.4
29SJ 1360	13.5
29SJ 629	15.3
29SJ 627	21.4
29SJ 389	16.3
29SJ 390	-
29SJ 391	22.1
29SJ 633	26.2

Most abraders are made of sandstone with some variation in the use of the soft and hard varieties (Table 5.153). The use of cobble materials is also interesting. Quartzite is either favored or the most available material. Quartzite cobbles are found in the Ojo Alamo formation. One would expect that the greatest variation in cobble materials might occur during late Pueblo II to early Pueblo III times at the height of the exchange system in the San Juan Basin. Table 5.154 demonstrates that this is not the case.

The greater reliance put on cobble tools by the earlier groups (see Tables 5.121 and 5.153) may have caused them to go fair distances to acquire suitable cobbles. Most of the material types, other than the local quartzites, could have been found along the San Juan River to the north. Wills (1977—Chapter 6 of this volume) has noted a similar decline in the use of quartzite hammerstones over time. The effort to acquire cobble materials declined in the two main tool categories that they represent.

Table 5.153 Percentage of material type per site.

Site Number	Percentage of Cobble Material													
	Soft s.s.	Medium s.s.	Hard s.s.	Very hard s.s.	Silt-stone	Lime-stone	Meta-morph.	Granite	Igneous	Band chert	Chert	Quart-zite	Quartz	Other
29SJ 423	23.1	2.6	5.1	10.3	-	-	5.1	-	-	-	2.6	51.3	-	-
29SJ 1659	5.3	-	21.1	31.6	-	-	-	-	-	-	-	36.8	5.3	-
29SJ 299	8.6	-	20.4	23.7	1.1	-	-	4.3	3.2	-	-	38.7	-	-
29SJ 628	13.4	9.2	23.9	18.3	-	-	1.4	-	2.1	-	-	31.7	-	-
29SJ 721	-	-	25.0	25.0	-	-	-	-	-	-	-	50.0	-	-
29SJ 724	13.0	13.0	21.7	13.0	-	-	-	-	-	-	-	34.8	-	4.3
29SJ 1360	22.5	3.4	19.1	23.6	-	-	2.2	-	1.1	-	-	27.0	1.1	-
29SJ 629	9.7	8.1	35.9	31.5	0.4	0.4	-	0.8	-	0.4	-	12.9	-	-
29SJ 627	11.6	10.4	32.3	22.6	0.8	0.4	0.6	0.2	0.6	-	-	19.8	0.6	-
29SJ 389	13.5	4.1	39.2	40.4	0.1	-	0.1	0.1	0.1	-	-	1.8	0.2	0.3
29SJ 390	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-
29SJ 391	4.7	-	51.2	39.5	-	-	-	-	-	-	-	2.3	-	-
29SJ 633	13.7	10.7	49.6	23.7	-	-	-	-	0.8	-	0.8	0.8	-	-
Totals No.	277	140	770	681	7	3	10	8	12	1	2	291	9	4

Table 5.154. Cobble materials.

Site Number	Metamorphic	Granite	Igneous	Banded chert	Chert	Quartzite	Quartz
29SJ 423	2	-	-	-	1	20	-
29SJ 1659	-	-	-	-	-	7	1
29SJ 299	-	4	3	-	-	36	-
29SJ 628	2	-	3	-	-	45	-
29SJ 721	-	-	-	-	-	2	-
29SJ 724	-	-	-	-	-	8	-
29SJ 1360	2	-	1	-	-	24	1
29SJ 629	-	2	-	1	-	32	-
29SJ 627	3	1	3	-	-	99	3
29SJ 389	1	1	1	-	-	15	2
29SJ 391	-	-	-	-	-	2	2
29SJ 633	-	-	1	-	1	1	-

The tendency for a site to have a certain shaped abrader is undoubtedly influenced by the contribution of each type of abrader (Table 5.155). The circular-shaped abraders are largely the cobbles and these dominate the earlier sites; however, it is possible that the rectilinear versus the other-shaped artifacts could give us an index of selection in sandstone for flat rectangular forms.

Table 5.155. Percentage of abrader shapes by site.

Site Number	Rectilinear	Circular	Other
29SJ 423	2.9	64.7	32.4
29SJ 1659	11.8	58.8	29.4
29SJ 299	23.9	62.5	13.6
29SJ 628	10.3	41.0	48.7
29SJ 721	33.3	33.3	33.3
29SJ 724	29.4	35.3	35.3
29SJ 1360	39.5	38.4	22.1
29SJ 629	38.3	19.9	41.8
29SJ 627	36.1	35.3	28.6
29SJ 389	37.4	7.4	55.2
29SJ 390	50.0	-	50.0
29SJ 391	59.8	15.9	24.4
29SJ 633	29.7	-	70.3

The variable "previous form" should provide information on the utilization of stone. If good sandstone was hard to acquire, we would expect much reuse of artifacts. Good artifactual sandstone may have had to have been quarried. Readily available artifact blanks were probably collected by earlier groups for use as building stone and as artifacts. By the time the large masonry sites began to be built, extensive quarrying was necessary. Although one would expect that this activity would result in a greater availability of material, this does not seem to be the case. It is in the later sites where the greatest reutilization occurs (Table 5.156), perhaps reflecting adventitious selection of raw material.

Manos are by far the most likely artifact to be reused as abraders; 15.3 percent of all abraders are reused manos. When the sites with very small sample sizes are eliminated and the sites are ranked by the percent of reutilization, the following order is evident (Table 5.157).

29SJ 629 is the only site that is out of place temporally, otherwise those with less than 15 percent are Basketmaker II and Pueblo I sites, with large numbers of polishing stones which holds these figures down. 29SJ 629 is out of sequence because of the large number of lapidary abraders from the site. These comprise 35 percent of the site total, and only 6.0 percent of these had a previous form.

Table 5.158 gives the number and percentage that each abrader type contributes to a site's assemblage. These data will be discussed within the context of each site in the final section.

The kinds of manufacturing techniques were fairly consistent (Table 5.159). The unmodified abraders ranged from 56.6 percent to 66.7 percent of the site samples. The exceptions are due to small sample sizes and large numbers of polishing stones. 29SJ 633 has an unusually high percentage of

Table 5.156. Reuse of abraders.

	Natural Forms			Artifactual Forms						
							Slab			
	None/	Concre-	River							
Site Number	Unknown	tion	Cobble	Mano	Metate	Abrader	Cover	Anvil	Other	Reused
29SJ 423	30.8	-	59.0	10.3	-	-	-	-	-	10.3
29SJ 1659	47.4	-	47.4	-	5.3	-	-	-	-	5.3
29SJ 299	34.4	4.3	48.4	7.5	2.2	-	2.2	-	1.9	13.8
29SJ 628	44.4	5.6	35.9	10.6	1.4	-	0.7	1.4	-	14.1
29SJ 721	25.0	-	50.0	25.0	-	-	-	-	-	25.0
29SJ 724	52.1	-	34.8	4.3	-	-	-	8.7	-	13.0
29SJ 1360	46.1	2.2	30.0	18.0	-	-	-	1.1	2.2	21.3
29SJ 629	71.4	1.2	13.7	5.2	1.1	-	5.2	0.4	1.6	13.5
29SJ 627	51.9	2.0	22.6	18.2	1.6	0.4	2.0	0.4	0.8	23.4
29SJ 389	73.3	2.1	2.9	15.0	2.9	0.6	1.4	-	1.8	21.7
29SJ 390	66.7	-	-	-	33.3	-	-	-	-	33.3
29SJ 391	48.8	1.2	4.7	39.5	4.7	-	1.2	-	-	45.4
29SJ 633	67.9	0.8	2.3	22.9	3.1	1.5	1.5	-	-	29.0

Table 5.157. Sites ranked by the amount of reutilization.

Site Number	%
29SJ 423	10.3
29SJ 724	13.0
29SJ 629	13.5
29SJ 299	13.8
29SJ 628	14.1
29SJ 1360	21.3
29SJ 389	21.7
29SJ 627	23.4
29SJ 633	29.0
29SJ 391	45.4

Table 5.158. *Abrader types by site.*

	Active Abraders											Passive Abraders								
Sites	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Number Percentage																				
29SJ 423	3 7.7	3 7.7	- -	- -	- -	- -	- -	- -	- -	- -	- -	5 12.8	1 2.6	- -	- -	- -	- -	- -	- -	- -
29SJ 1659	- -	4 21.0	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	1 5.3	- -	- -	- -	- -	- -	- -
29SJ 299	6 6.4	16 17.2	1 1.1	- -	- -	- -	2 2.2	- -	- -	- -	1 1.1	3 3.2	7 7.5	- -	- -	- -	- -	- -	- -	- -
29SJ 628	7 4.9	28 19.7	1 0.7	- -	- -	4 2.8	1 0.7	- -	- -	- -	3 2.1	10 7.0	5 3.5	- -	- -	- -	2 1.4	- -	2 1.4	- -
29SJ 721	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
29SJ 724	2 8.7	2 8.7	- -	- -	- -	- -	- -	- -	- -	- -	- -	4 17.4	2 8.7	- -	- -	- -	- -	- -	- -	- -
29SJ 1360	13 14.6	15 16.8	4 4.5	1 1.1	- -	1 1.1	1 1.1	3 3.4	- -	- -	1 1.1	2 2.2	4 4.5	4 4.5	- -	- -	- -	- -	- -	- -
29SJ 629	19 7.7	21 8.5	1 0.4	5 2.0	- -	1 0.4	- -	2 0.8	- -	- -	8 3.2	31 12.5	9 3.6	83 33.5	- -	- -	1 0.4	- -	4 1.6	- -
29SJ 627	60 12.0	119 23.8	11 2.2	3 0.6	- -	6 1.2	3 0.6	4 0.8	1 0.2	1 0.2	14 2.8	26 5.2	30 6.0	22 4.4	- -	- -	1 0.2	1 0.2	- -	- -
29SJ 389	58 6.9	271 32.3	19 2.3	12 1.4	54 6.4	3 0.4	6 0.7	14 1.7	- -	- -	26 3.1	194 23.1	15 1.8	5 0.6	3 0.4	2 0.2	6 0.7	- -	16 1.9	1 0.1
29SJ 390	- -	1 33.3	- -	- -	- -	1 33.3	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
29SJ 391	3 3.5	36 41.8	2 2.3	3 3.5	8 9.3	- -	- -	- -	- -	- -	8 9.3	14 16.3	1 1.2	1 1.2	- -	- -	- -	- -	- -	- -
29SJ 633	24 18.3	58 44.3	1 0.8	1 0.8	- -	- -	- -	1 0.8	1 0.8	- -	4 3.1	5 3.8	7 5.3	2 1.5	- -	- -	- -	- -	2 1.5	- -
Totals	195	574	40	25	62	16	13	24	2	1	65	294	81	118	3	2	10	1	24	1

Table 5.158. (continued)

Sites	Grooved Abraders				Polishing Stones					Anvils		
	30	31	32	33	40	41	42	43	44	50	52	Total
Number Percentage												
29SJ 423	1	-	-	-	15	5	4	-	-	2	-	39
	2.6	-	-	-	38.5	12.8	10.3	-	-	5.1	-	
29SJ 1659	1	-	-	-	4	4	1	-	-	4	-	19
	5.3	-	-	-	21.1	21.1	5.3	-	-	21.1	-	
29SJ 299	-	-	-	-	12	8	22	1	-	14	-	93
	-	-	-	-	12.9	8.6	23.7	1.1	-	15.1	-	
29SJ 628	3	4	-	-	35	12	4	2	-	17	2	142
	2.1	2.8	-	-	24.6	8.5	2.8	1.4	-	12.0	1.4	
29SJ 721	-	-	-	-	1	-	-	-	-	3	-	4
	-	-	-	-	25.0	-	-	-	-	75.0	-	
29SJ 724	-	-	-	-	3	4	-	1	-	5	-	23
	-	-	-	-	13.0	17.4	4.3	-	-	21.7	-	
29SJ 1360	2	-	-	-	18	6	3	1	-	8	2	89
	2.2	-	-	-	20.2	6.7	3.4	1.1	-	9.0	2.2	
29SJ 629	2	-	1	-	24	4	3	2	-	24	3	248
	0.8	-	0.4	-	9.7	1.6	1.2	0.8	-	9.7	1.2	
29SJ 627	4	1	2	-	57	27	23	6	-	65	13	500
	0.8	0.2	0.4	-	11.4	5.4	4.6	1.2	-	13.0	2.6	
29SJ 389	18	4	1	1	17	-	2	-	-	79	12	839
	2.1	0.5	0.1	0.1	2.0	-	0.2	-	-	9.4	1.4	
29SJ 390	-	-	-	-	-	-	-	-	-	1	-	3
	-	-	-	-	-	-	-	-	-	33.3	-	
29SJ 391	-	-	-	-	-	-	1	-	2	7	-	86
	-	-	-	-	-	-	1.2	-	2.3	8.1	-	
29SJ 633	2	-	-	-	3	-	-	-	-	17	3	131
	1.5	-	-	-	2.3	-	-	-	-	13.0	2.3	
Totals	33	9	4	1	189	70	63	13	2	246	35	2,216

Table 5.158. (continued)

Key

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abrader.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
23 = Whetstones.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.159. Manufacture of abraders by site.

Site Number	Unmodified	Flaked	Abraded	Pecked	Flaked and abraded	Pecked and flaked	Pecked and abraded	Flaked, pecked and abraded
29SJ 423	82.1	-	5.1	5.1	2.6	-	2.6	2.6
29SJ 1659	64.7	5.9	-	-	11.8	-	17.6	-
29SJ 299	65.9	9.1	2.3	4.5	4.5	1.1	5.7	6.8
29SJ 628	58.0	13.0	6.9	2.3	11.5	1.5	2.3	4.6
29SJ 721	50.0	-	-	-	-	-	-	50.0
29SJ 724	69.1	-	-	4.8	33.3	-	-	-
29SJ 1360	58.6	4.6	8.0	-	9.2	6.9	5.7	6.9
29SJ 629	56.6	24.7	4.3	3.8	2.6	5.5	0.4	2.1
29SJ 627	45.0	12.5	5.3	2.5	13.8	7.4	4.1	9.4
29SJ 389	65.7	20.0	3.2	2.3	4.1	3.0	0.6	1.0
29SJ 390	66.7	33.2	-	-	-	-	-	-
29SJ 391	65.1	5.8	4.7	1.2	15.1	4.7	3.5	-
29SJ 633	84.0	10.7	1.5	-	-	3.1	0.8	-
Totals	1,273	324	87	50	155	89	47	80

unmodified abraders and yet has a fair sample size. It is the latest site in the sample and may reflect a decrease in the effort put into abrading tools.

When evaluating the amount of work put into these artifacts (Tables 5.160 and 5.161), two things must be considered. First, the percentage that was unmodified (range = 45.4 percent to 84.0 percent); then, what the percentages are after the unmodified abraders are removed from the sample. 29SJ 627 has a lower percentage than expected. The amount of ground stone from that site was so large that some specimens were discarded in the field, probably the more nondescript pieces. This may account for the low percentage of unmodified abraders. The Una Vida (29SJ 391) sample included those from our excavations, plus catalogued specimens from Gordon Vivian's 1960 excavations. Catalogued items are generally the nicer examples. The 29SJ 1360 sample suffered from a sampling strategy that also favored large, nice objects. With this considered, Pueblo Alto then has a higher frequency of extensively modified abraders than the smaller village sites.

It is obvious (Table 5.162) that very few abraders were used extensively or wore out. Not analyzing small fragments and collection strategies has an undetermined effect on this aspect of analysis. The sites where abraders have the heaviest use are the earlier sites. These all had high frequencies of polishing stones and polishing stones make up 47 percent of the extensively used artifacts. It appears that the polishers were being curated.

Rather than make six different tables, the percentages of the abraders in a site that did not have that kind of wear is recorded in Table 5.163. Again, the artifact type frequency has an effect on the results, usually the large proportion polishers of the early sites. In general, there are no site-to-site trends, although there might be some in a single type through time. This was not investigated further.

Tables 5.164 and 5.165 describe the secondary use of abraders by site. Hammerstone and chopper use are the most prevalent. Neither of these are actually secondary; they were more likely used at the same time and possibly in conjunction with the abrader use. In all other instances, the abrader use has been abandoned. Secondary use is not that common, suggesting that good sandstone in abrader sizes was relatively abundant. The sites with the lowest reuse are Pueblo Alto, Una Vida, and 29SJ 633, the latest sites in the sample and those with the most masonry. This is exactly opposite of what was found for the reuse of other artifact types as abraders. The amount of secondary use varied but not a lot (see Table 5.164).

The Sites

All of the sites from which the abraders were analyzed were from Chaco Project excavations. Figure 5.53 locates these sites within Chaco Culture National Historical Park. It was hoped that by considering the assemblage from each site, more information on abrader function would be gained.

Table 5.160. Amount of work invested in abraders by site.

Site Number	None	Slight	Moderate	Extensive
29SJ 423	82.1	10.3	7.7	-
29SJ 1659	61.1	5.6	33.3	-
29SJ 299	66.7	14.9	17.2	1.1
29SJ 628	60.0	13.1	24.6	2.3
29SJ 721	50.0	-	50.0	-
29SJ 724	61.9	9.5	28.6	-
29SJ 1360	59.8	9.2	24.1	6.9
29SJ 629	58.6	24.6	15.1	1.3
29SJ 627	45.4	22.6	28.7	3.3
29SJ 389	66.2	15.8	13.1	4.9
29SJ 390	66.7	33.3	-	-
29SJ 391	65.1	3.5	23.3	8.1
29SJ 633	84.0	8.4	6.9	0.8

Table 5.161. Amount of work invested in modified abraders.

Site Number	Slight	Moderate	Extensive
29SJ 423	57.2	42.9	-
29SJ 1659	14.4	85.8	-
29SJ 299	44.8	62.1	3.4
29SJ 628	32.6	61.4	5.8
29SJ 721	-	100.0	-
29SJ 724	25.2	75.6	-
29SJ 1360	22.9	60.1	17.2
29SJ 629	59.8	37.8	3.1
29SJ 627	41.4	52.6	6.0
29SJ 389	46.7	38.7	14.5
29SJ 390	100.0	-	-
29SJ 391	10.0	66.6	23.3
29SJ 633	52.8	43.2	4.8

Table 5.162. Amount of use of abraders by site.

Site Number	Light	Moderate	Heavy	Mixed
29SJ 423	30.8	64.1	5.1	-
29SJ 1659	31.6	68.4	-	-
29SJ 299	22.2	70.0	5.6	2.2
29SJ 628	40.6	55.8	2.9	0.7
29SJ 721	25.0	75.0	-	-
29SJ 724	52.2	39.1	8.7	-
29SJ 1360	19.1	71.9	7.9	1.1
29SJ 629	30.4	69.2	0.4	-
29SJ 627	33.6	63.8	1.8	0.8
29SJ 389	45.9	53.8	0.4	-
29SJ 390	66.7	33.3	-	-
29SJ 391	40.7	58.1	1.2	-
29SJ 633	72.5	27.5	-	-

Table 5.163. Absence of other use on abraders by site.

Site Number	Edge-rounding	Cutting gouging	Grinding polish	Striations	Pecks	Staining
29SJ 423	87.2	74.4	2.6	28.2	41.0	92.3
29SJ 1659	73.7	68.4	-	21.1	52.6	63.2
29SJ 299	65.6	60.2	1.1	12.9	37.6	71.0
29SJ 628	57.0	77.5	4.2	19.0	43.0	62.7
29SJ 721	25.0	25.0	-	25.0	-	-
29SJ 724	69.6	69.6	4.3	30.4	47.8	95.7
29SJ 1360	67.4	79.8	-	19.1	47.2	83.1
29SJ 629	34.3	73.8	2.0	13.3	87.9	83.5
29SJ 627	66.9	60.3	1.0	17.0	43.9	85.8
29SJ 389	55.5	66.6	1.8	18.4	99.0	87.7
29SJ 390	66.7	100.0	-	33.3	100.0	100.0
29SJ 391	16.3	47.7	1.2	8.1	97.7	69.8
29SJ 633	61.1	55.0	0.8	19.8	100.0	95.4

Table 5.164. Amount of secondary use by site.

Site Number	Light	Moderate	Heavy
29SJ 423	25.0	70.0	5.0
29SJ 1659	30.0	70.0	-
29SJ 299	34.0	61.7	4.2
29SJ 628	37.8	56.7	5.4
29SJ 721	100.0	-	-
29SJ 724	40.0	50.0	10.0
29SJ 1360	33.3	59.5	7.1
29SJ 629	50.6	44.6	4.8
29SJ 627	41.1	50.9	7.9
29SJ 389	55.3	42.0	2.6
29SJ 391	68.4	26.3	5.2
29SJ 633	86.9	13.0	-

Unfortunately, but typically, little was learned because of a lack of the perishable materials thought to be worked by many abrader types, good recording of provenience information that would allow for associational inferences, lack of primary context abraders and the materials being worked, and small sample sizes for most types and proveniences.

Several trends in abrader use were noted. The Basketmaker III and Pueblo I sites were the most useful in that these were sites without intrusions from later time periods. Sites in this time span and the portions of the multicomponent sites which date in this time period are characterized by:

1) low percentages of active and passive abraders,
2) high percentages of polishers,
3) high percentages of burned abraders (except 29SJ 423),
4) much variability in cobble materials,
5) less reuse of other artifacts as abraders than in later times,
6) fewer abraders that were extensively modified,
7) abraders that were more often heavily used than in later sites, and
8) secondary use was common but mostly as hammerstones.

Polishers had a greater importance, possibly because they were used for many activities that were later accomplished with active abraders, or perhaps the traditional explanation of their use in maintaining clay surfaces is correct. Mud walls are characteristic of subterranean structures into Pueblo II times.

Table 5.165. Secondary artifact types of abraders by site.

Site Number	Corn-breaker	Active Abrader	Passive Abrader	Palette	Grooved Abrader	Anvil	Polishing stone	Lap Stone
29SJ 423	-	-	-	-	-	-	-	-
29SJ 1659	1	-	-	-	-	-	1	-
29SJ 299	-	1	-	-	-	-	-	-
29SJ 628	1	-	1	-	-	-	-	-
29SJ 721	-	-	-	-	-	-	-	-
29SJ 724	-	1	-	-	-	-	-	-
29SJ 1360	4	-	-	-	1	-	-	-
29SJ 629	1	-	1	-	3	1	-	1
29SJ 627	1	1	-	-	5	1	-	-
29SJ 389	-	2	-	3	3	2	-	-
29SJ 391	-	-	-	-	-	-	-	-
29SJ 633	-	-	-	-	-	-	-	-
Totals	8	5	2	3	12	4	1	1

Site Number	Hammer-stone	Chopper	Pot Lid	Griddle	Manolike Slab	Architectural Slab	O.S.S.	Other	Reused
29SJ 423	17	3	-	-	-	-	-	-	51.3
29SJ 1659	7	2	-	-	-	-	-	-	-
29SJ 299	38	7	-	-	-	-	-	1	50.5
29SJ 628	42	30	-	-	-	-	-	-	52.1
29SJ 721	1	2	-	-	-	-	-	-	75.0
29SJ 724	7	2	1	-	-	-	-	-	47.8
29SJ 1360	20	17	-	-	-	-	-	-	47.2
29SJ 629	24	46	-	-	6	-	-	-	33.5
29SJ 627	88	168	-	-	-	-	1	-	53.1
29SJ 389	45	193	-	1	7	5	-	1	31.2
29SJ 391	10	9	-	-	-	-	-	-	22.1
29SJ 633	5	18	-	-	-	-	-	-	17.5
Totals	304	497	1	1	13	5	1	2	

Although later masonry walls were plastered, the thin uniform layers may have required a different form of tool than those used to maintain an earthen wall. The selection for cobble materials was greatest at this time, 60 percent to 80 percent of the metamorphic cobbles, at least 83 percent of the granites, and 66.6 percent of the igneous cobbles are from Basketmaker III to early Pueblo II times. Reuse would be less since there would be fewer discarded objects to pick up and reuse. This may also account for the heavier primary and secondary use. The tool kit at this time was a more generalized one with a longer and more diverse use. Selection for harder or better cobble material may reflect this.

The Pueblo II period is more difficult to characterize; all of our sites from this time period were overlain and disturbed by Pueblo III occupations so that few clear-cut proveniences were available. Two things are clear: first, active abraders were replacing polishers. Second, lapidary stones make a real appearance. Only one lapidary abrader was found in an earlier site; although Mathien (Chapter 10, this volume) has noted that there was turquoise debris at both Shabik'eshchee Village (29SJ 1659) and 29SJ 423. This, too, is interesting since they both have early great kivas and small sample sizes compared to the other Basketmaker sites. It does suggest that specialized craftsmanship was not common in the canyon before Pueblo II times.

The Pueblo III period is equally hard to isolate and shows very few distinctive trends. There was less secondary use of abraders. Presumably because of quarrying activity for wall rocks, there was plenty of good stone available and it was not necessary to

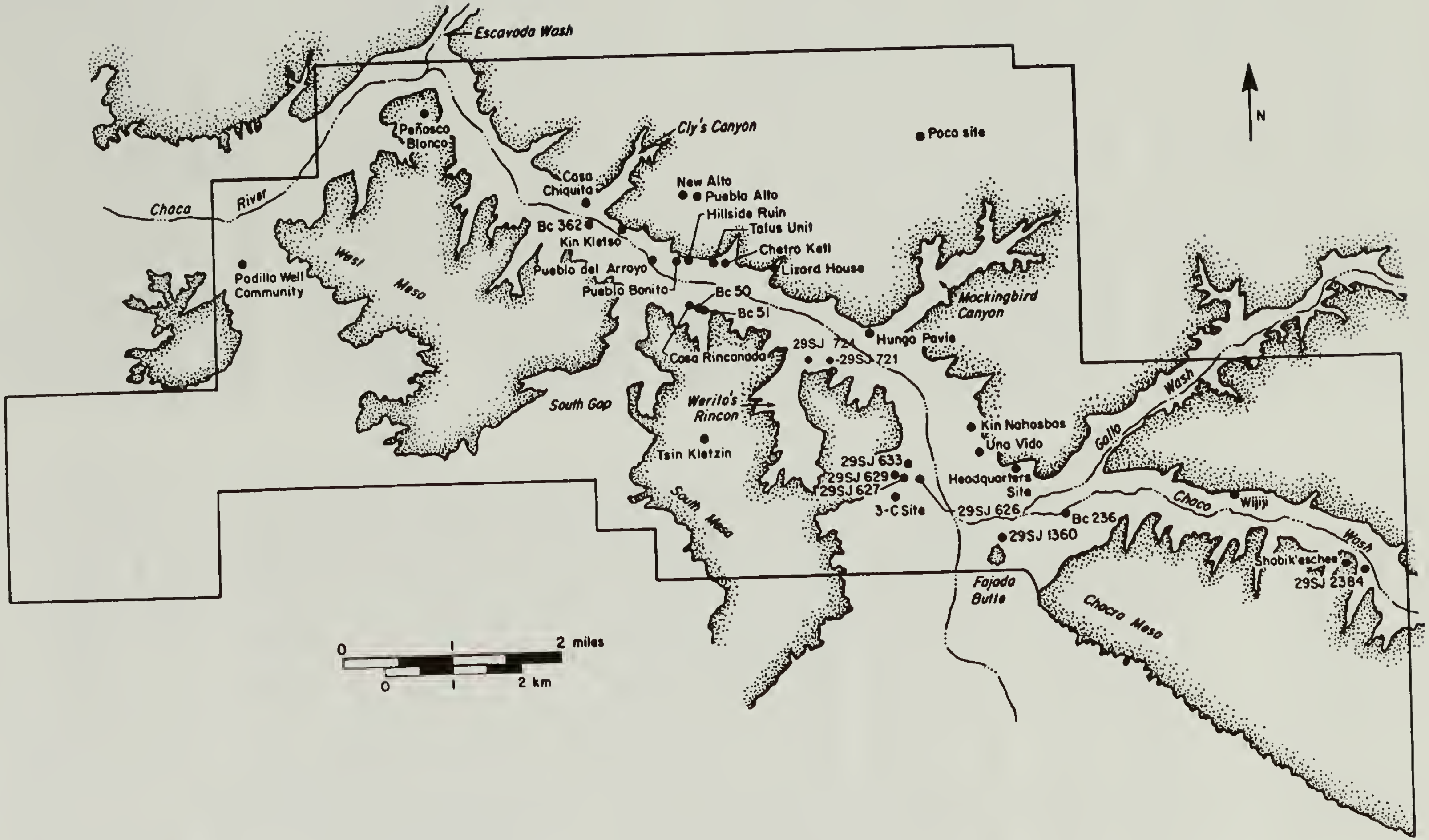


Figure 5.53. Important greathouse and small-house sites in Chaco Canyon.

reutilize rock. Also related to this might be an increase in the selection for the very hard sandstones used in abraders. The wall rocks from Pueblo Alto and Una Vida are good sandstone, and these may have been used or the appropriate materials collected were from the same source as the abraders.

29SJ 299

Site 299 is a Basketmaker III and Pueblo I site located on a small ridge attached to Fajada Butte. The Basketmaker portion of the site consisted of four pitstructures and eleven rooms (Loose 1979). The Pueblo I component consisted of Pithouse E, four rooms, and associated features (Windes 1976c).

Ninety-three abraders were recovered from 29SJ 299, 86.0 percent of these were complete. Provenience information can be found in Table 5.166. Detailed information will be given for those structures that have in situ artifact assemblages.

Pithouse A. This structure was burned with the household tools left in place. Stratum B of the fill consisted of roof-fall materials; this artifact assemblage led Loose "to believe that a certain amount of food processing and perhaps cooking was taking place on top of the roof" (Loose 1979:3). The mano and metates on which this conclusion was based were actually abraders and suggest a different kind of roof-top activity or possibly tool storage, rather than food preparation. The floor and its associated features had 19 abraders. Bin B contained six large polishers, two manos, and an awl, most neatly placed around the bins edges as if to allow for some sort of activity. A single subfloor cist contained an active abrader and two floor polishers. Several distinct groupings of abraders were found on the floor. One consisted of a passive abrader-anvil, an anvil, and two floor polishers; another included several ceramic vessels, an active abrader and a floor polisher; and there was an anvil and a pot polisher in Bin C. Unfortunately, there were no other materials on the floor. The associations of groups of abraders may represent work areas.

Pithouse B. This structure was a later reuse of the site in the form of a Pueblo II kiva. Most of the abraders (11 of 15) were in a group that Loose believed were placed in the kiva immediately after the roof was removed as a ceremonial closing or desanctification of the kiva.

Pithouse C. This structure was never completed or occupied.

Pithouse D. Also burned but without many household goods, the excavator thought that the structure had been "cleaned out, ceremonially closed, and intentionally burned at the time of abandonment" (Loose 1979:47). Polishers are again the most common abraders. Bin B in this structure contained three pot polishers and one polisher, and a subfloor cist contained three floor polishers and one polisher.

Pithouse E. The Pueblo I pithouse excavated by Windes contained very little material on the floor; most was removed before abandonment. Noticeably absent from this structure were the polishers, which were probably curated. This does pose the question of why so many were left in Pithouse D if the abandonment had been orderly in both.

Site 29SJ 299 is typical of a Basketmaker site in its assemblage of abraders; however, it has the highest "real" percentage of burning, 39.9 percent, which is not surprising since two structures containing numerous abraders were burned. It also has an unusually high percentage of complete artifacts, perhaps again due to the burning and abandonment of the pitstructures.

Although quartzite cobbles predominate, granite and igneous ones were also found. Of these, three of the granite and two igneous cobbles were from Pithouse A. Pithouse D had only one igneous cobble, possibly an indication of the worth of the materials.

Reuse was not uncommon and quite diverse. Slight or moderate modification was the rule; only one abrader exhibited extensive modification. Light use was recorded for only 22.2 percent of the total, suggesting a well-established abrader assemblage at the site.

Pueblo Alto (29SJ 389)

Pueblo Alto is a large Bonito Phase site located north of the canyon proper. It was chosen for excavation because of its visibility and location in relation to known Chacoan roads. Two-and-a-half field seasons were spent on this site. Excavation was carried out in 14 rooms, numerous plaza tests were made, and the trash mound was sampled. The time

Table 5.166. 29SJ 299 abraders.

		Active Abraders											Passive Abraders								
Provenience		10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Surface strippng		2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T.T. 1,	Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse A,	Surface	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Stratum a	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Stratum b and c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Antechamber fill	-	3	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
	Floor and features	1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
	Room total	1	6	-	-	-	-	1	-	-	-	-	1	3	-	-	-	-	-	-	-
Pithouse B,	Level 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	South rock fall	-	3	-	-	-	-	-	-	-	-	1	1	3	-	-	-	-	-	-	-
	Vent	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	2	4	1	-	-	-	-	-	-	-	1	1	3	-	-	-	-	-	-	-
Pithouse C,	Level 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse D,	Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor and features	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hearth floor	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Room total	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pithouse E,	Fill	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Level 5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 6	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor and features	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	1	1	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-
Room 3,	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 5,	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramada,	Fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor and features	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals		6	16	1	-	-	-	2	-	-	-	1	3	7	-	-	-	-	-	-	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.166. (continued)

Provenience		Grooved Abraders 30	31	32	33	Polishing Stones 40	41	42	43	44	Anvils 50	52	Sub	Total
Surface stripping		-	-	-	-	-	1	-	-	-	-	-	3	3
T.T. 1,	Level 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Pithouse A,	Surface	-	-	-	-	-	-	1	-	-	-	-	3	-
	Stratum a	-	-	-	-	-	1	-	-	-	-	-	2	-
	Stratum b and c	-	-	-	-	2	1	4	-	-	2	-	9	-
	Antechamber fill	-	-	-	-	1	-	-	-	-	2	-	8	-
	Floor and features	-	-	-	-	2	-	10	1	-	2	-	19	-
	Room total	-	-	-	-	5	2	15	1	-	6	-	-	41
Pithouse B,	Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-
	South rock fall	-	-	-	-	1	-	-	-	-	2	-	11	-
	Vent	-	-	-	-	-	-	-	-	-	-	-	3	-
	Room total	-	-	-	-	1	-	-	-	-	2	-	-	15
Pithouse C,	Level 4	-	-	-	-	1	-	-	-	-	-	-	2	2
Pithouse D,	Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
	Level 2	-	-	-	-	1	1	-	-	-	-	-	2	-
	Floor and features	-	-	-	-	4	3	5	-	-	-	-	13	-
	'Hearth floor'	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	-	-	-	5	4	5	-	-	-	-	-	17
Pithouse E,	Fill	-	-	-	-	-	-	-	-	-	-	-	1	-
	Level 5	-	-	-	-	-	-	-	-	-	1	-	2	-
	Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
	Floor and features	-	-	-	-	-	-	-	-	-	2	-	3	-
	Room total	-	-	-	-	-	-	-	-	-	3	-	-	7
Room 3,	Fill	-	-	-	-	-	-	1	-	-	-	-	1	1
Room 5,	Fill	-	-	-	-	-	1	-	-	-	-	-	1	1
Ramada,	Fill	-	-	-	-	-	-	-	-	-	1	-	2	-
	Floor and features	-	-	-	-	-	-	1	-	-	2	-	3	-
	Room total	-	-	-	-	-	-	1	-	-	3	-	-	5
Totals		-	-	-	-	12	8	22	1	-	14	-	-	93

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

range involved included Red Mesa Black-on-white, Classic Chaco Black-on-white, and later Chaco-McElmo Black-on-white ceramic associations. The exact nature of the site has been questioned; were this and the other large sites within the canyon actual habitation sites, were they largely for storage of resources exchanged throughout the basin, or were they only seasonally visited (Windes 1987)?

Pueblo Alto had the largest number of abraders collected from Chaco Canyon. A total of 839 were analyzed, of which 62.5 percent were complete. At least 200 of these came from wall clearing. Table 5.167 gives provenience information on the abraders. Where used prehistorically, very few proveniences had enough abraders left to be discussed.

Room 103. The largest number of abraders from any one provenience other than the trash mound came from this room, 107 or 12.7 percent of the total. Those (57) from the fill and floor fill were attributed by the room excavators to a layer of trash and roof debris, which may also be true for some of the floor contact artifacts. This group has more larger forms, such as passive abraders and anvils, than does Pueblo Alto as a whole, possibly related to roof construction or roof-top activities. Of the abraders associated with Floor 1, nine were from one pit and were packed in to form a door step. This leaves one other from a feature and three actual floor contact specimens. Only the hard active abrader was complete. Floor 3 associations included eight abraders but they were associated with the construction of a mealing bin complex rather than being in primary context.

Room 110. A large number of abraders (33) were found on or in association with Floor 1 of this room. Most of these were at the southern end and were used in construction or in association with six mealing bins. Fifteen of these are hard active abraders, and some may have functioned as part of the corn grinding tool kit.

There is a striking difference between the numbers of abraders found in the rooms from the western portions and those from the rooms in the northern portions of the roomblock. The western rooms (Rooms 103, 109, 110, 112, and 239) produced 175 abraders, while those from the north (Rooms 139, 142, 143, 145, 146, and 147) contributed only 61 abraders. The western rooms have more habitation roomlike features than those in the north. The sheer number of abraders suggests that more household or rebuilding activities took place in the western rooms.

Good abrader proveniences at Pueblo Alto were uncommon. Very little was left behind so that the only possibility of discerning meaningful assemblage information from Pueblo Alto came from comparisons of trash abrader frequencies associated with Red Mesa, Gallup, and Chaco-McElmo Black-on-white ceramics assemblages. Unfortunately, isolating a sufficiently large sample, especially with Red Mesa Black-on-white associations, proved quite difficult. This also assumes that the trash being generated was from similar activities. Table 5.168 attempts to compare abraders found with Gallup and Chaco-McElmo Black-on-white ceramics, but the sample sizes are so low that conclusions are tenuous. The only striking difference between the Gallup and Chaco-McElmo Black-on-white associations is the use of soft active abraders, and the difference is not that great considering the sample size. It could, however, indicate a reduction in woodworking activities, such as the preparation of roof beams, which was not occurring at the same rate in Chaco-McElmo Black-on-white as in the Gallup Black-on-white ceramic associated periods. There is slightly more diversity in the Chaco-McElmo Black-on-white ceramic associated trash, and that is about all that can be said.

Other Observations. The low percentage of burned abraders at Pueblo Alto is not surprising; none of the structures excavated were burned. Pueblo Alto, followed by Una Vida, had the highest percentage of good hard sandstone use, 40.4 percent and 39.5 percent respectively, whereas most other sites ranged around 20 percent to 30 percent. A variety of cobble materials exist; in fact only Pueblo Alto and 29SJ 627 have five material types. This is more significant when the number of cobbles is considered. Pueblo Alto had only 24 cobble abraders where 29SJ 627 had 113 abraders. Other sites have more cobbles but less diversity.

Next to 29SJ 1360 and Una Vida, Pueblo Alto had the highest percentage of extensively modified abraders, 14.5 percent of those that were modified. Most of the smaller sites have ranges from three to six percent. Given that so much of the sample from Pueblo Alto was from wall clearing, this could be significant. An analysis of the kinds and condition of

Table 5.167. Pueblo Alto abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Site general/wall clearing	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 51, Structural fl. 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 102, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 103, Fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 1	-	-	-	-	1	-	-	-	-	-	1	8	-	-	-	-	-	-	-	-
Layer 2	-	13	-	-	1	-	-	-	-	-	3	15	-	1	-	-	-	-	1	-
Layer 2, floor fill	1	8	1	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-	1
Floor 1, association	2	3	-	-	-	-	-	-	-	-	-	5	2	-	-	-	-	-	-	-
Layer 3, floor fill	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 2, association	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 4, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 3, association	-	2	-	-	1	-	-	1	-	-	-	2	-	-	-	-	-	-	1	-
Layer 5, floor fill	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 4, association	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6, floor fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	4	31	1	-	3	-	-	1	-	-	5	37	2	1	-	-	-	-	3	1
Room 104, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 107, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 109, Layer 1	-	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Layers 2 and 3	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layers 3 and 4, floor fill	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	4	-	-	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Room 110, Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 1, floor fill	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Layer 2, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1, contact	-	3	-	-	1		-	-	-	-	1	2	1	-	-	-	-	-	-	-
Floor 1, association	2	12	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	2	-
Layer 5 (surface 4)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 7 (surface 6)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 10, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	3	20	-	-	1	-	-	-	-	-	2	5	1	-	-	-	-	-	2	-
Room 112, Layer 2	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Layer 3, floor fill	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1, association	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Layer 5, floor fill	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 7	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	1	5	2	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-	1	-
Room 119, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 127, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Room 135, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 137, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 138, Wall clearing	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 139, Layer 1	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
Layer 3	-	-	-	1	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 10, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 2, association	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room total	-	-	-	1	-	-	-	2	-	-	-	4	1	-	-	-	1	-	1	-
Room 142, Layer 3	1	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	1	-
Layer 4	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 6	-	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Layer 6, floor fill	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 2, association	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room total	1	4	1	1	1	-	-	-	-	-	-	5	1	-	-	-	-	-	2	-
Room 143, Layer 1	-	1	-	-	1	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-
Layer 2, floor fill	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 1, association	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Layer 8, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2, association	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	5	-	-	1	-	-	-	-	-	3	2	-	-	-	-	-	-	-	-
Room 145, Layer 7, floor fill	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-
Floor 1, association	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 10, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	1	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-
Room 146, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 2	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 5	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Floor 3, association	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	1	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-
Room 147, Wall clearing	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 2	-	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Layer 2, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5, floor fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Room total	-	5	-	-	-	-	-	-	-	-	-	1	1	-	-	-	1	-	-	-
Room 150, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 152, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 153, Wall clearing	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Room 166, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 173, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 177, Wall clearing	-	3	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 178, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 181, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 183, Wall clearing	-	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 186, Wall clearing	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	-	-	-	-
Room 188, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 193, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 197, Wall clearing	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 198, Wall clearing	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 200, Wall clearing	-	1	-	-	1	-	-	-	-	-	-	2	-	-	1	-	-	-	-	-
Room 201, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 207, Wall clearing	-	-	-	-	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Room 208, Wall clearing	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 210, Wall clearing	-	1	-	-	-	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-
Room 212, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 213, Wall clearing	3	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 215, Wall clearing	-	1	-	-	-	-	-	1	-	-	2	1	-	-	-	-	-	-	-	-
Room 216, Wall clearing	-	1	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Room 218, Wall clearing	-	2	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 219, Wall clearing	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Room 220, Wall clearing	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 221, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 222, Wall clearing	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room 229, Layer 1	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 230, Wall clearing	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 232, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 233, Wall clearing	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 236, Floor 3, association	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 4, association	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Kiva 2, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-
Kiva 5, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Kiva 6, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kiva 7, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Kiva 8, Wall clearing	-	2	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Kiva 9, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Kiva 10, Level 14	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 17	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 18	-	4	-	-	1	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-
Level 19	-	1	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Level 20	-	-	1	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 22	-	4	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 23	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Level 24	1	2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 25	-	2	-	-	-	1	-	-	-	-	-	1	-	-	-	-	1	-	-	-
Level 26	-	4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	1	-
Level 27	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room total	1	21	1	2	2	2	2	1	-	-	-	9	-	2	-	-	1	-	1	-
Kiva 12, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kiva 13, Level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 6	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kiva 14, Wall clearing	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kiva 15, Layer 1	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 3	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Layer 7	-	4	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Layer 7, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wall construction	-	5	-	1	1	-	-	-	-	-	-	6	1	-	-	-	-	-	-	-
Room total	-	11	1	1	1	-	-	-	-	-	2	9	1	-	-	-	-	-	-	-
Kiva 16, Level 1	-	1	-	-	-	1	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 3	2	1	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Room total	2	2	-	-	-	1	-	-	-	-	-	7	-	-	-	-	-	-	-	-
Kiva 17, Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Circular structure 1, Wall clearing	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Circular structure 2, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza 1, General	1	1	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza Grid 8, Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Surface 2, association	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 4, fill (layer 9)	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 15	-	5	-	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	1	-
Grid total	-	7	1	-	-	-	-	-	-	-	1	1	1	-	-	1	-	-	1	-
Plaza Grid 9, Layer 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
29, Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30, Slump, Other pit 1	2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
35, Layer 1	-	2	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 3	-	1	-	1	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 4 association	-	-	-	-	-	-	-	-	-	-	2	1	1	-	-	-	-	-	-	-
Surface 8 association	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	-	3	-	1	-	-	-	-	-	-	2	5	1	-	-	-	-	-	-	-
38, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
51, Layer 1	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
55, Layer 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
75, Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Surface 1	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-
95, Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
115, Layer 2	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
116, Layer 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
117, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
135, Layer 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
175, Layer 3, floor fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
195, Layer 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
202, Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
204, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
273, Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
274, Layer 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
275, Layer 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
280, Layer 3, floor fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
301, Layer 6	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 6	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
302, Layer 1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 2, floor fill	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 6, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	-	4	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza Grid 307, Layer 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major wall 1, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major wall 2, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major wall 3, Wall clearing	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major wall 4, Wall clearing	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Major wall 6, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Plaza feature 4, Wall clearing	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Other structure 3, Wall clearing	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other structure 4, Wall clearing	-	2	-	-	1	-	-	-	-	-	-	3	-	-	-	-	1	-	-	-
Other structure 5, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other structure 6, Wall clearing	-	10	-	-	7	-	-	1	-	-	1	11	-	-	-	-	-	-	-	-
Other structure 7, Wall clearing	1	2	-	-	-	-	-	-	-	-	-	3	1	-	1	-	-	-	-	-
Other structure 8, Wall clearing	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other structure 9, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Other structure 11, Wall clearing	-	1	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	-
Other structure 12, Wall clearing	-	1	-	-	3	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Plaza feature 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 1, Layer 2	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Room 3, Layer 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 3	1	5	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 3, floor fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 4, floor fill	-	-	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1, association	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Replasters 2-4	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	6	-	-	2	-	-	2	-	-	-	1	-	-	-	-	-	-	-	-
Room 4, Layer 2	-	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Layer 6	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 12, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	5	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room 5, Layer 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East Ruin, Room 14, Layer 1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 2, floor fill	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1, association	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room total	-	2	2	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Plaza 2, Grid 5, Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
161, Layer 2, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
181, Layer 2, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
182, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 2, floor fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
201, Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 8	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
221, Layer 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plaza 2 total	2	3	-	-	-	-	-	-	-	-	-	3	-	-	-	-	1	-	-	-
Parking Lot Ruin																				
Room 1, Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 4, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trash Mound																				
Grid 52, Surface	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Fill	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Grid 53, Layer 3	-	1	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Layer 4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 10	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 16	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	2	2	1	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	1	-
Grid 54, Layer 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 9	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 15	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 16	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Layer 17	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Grid total	5	4	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
Grid 55, Layer 3	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 17	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 19	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 21	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Grid total	2	4	-	-	2	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Grid 56, Layer 96	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 103	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 113	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.167. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Grid 70, Level 2	-	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	-	-	2	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Grid 127, Layer 5	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Grid 155, Level 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 6	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Level 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Grid 163, Level 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 183, Level 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 7	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 11	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 13	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	1	7	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Grid 211, Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 9	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 12	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 17	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	-	2	1	1	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Grid 239, Level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 5	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 7	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 10	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 11	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 13	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

Table 5.167. *(continued)*

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Level 17	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 19	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	2	7	-	1	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-
Grid 26, Level 6	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Level 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 14	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 15	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 17	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	2	1	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Grid 295, Level 6	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 10	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 12	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 13	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 17	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	2	1	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid 323, Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 14	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 16	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 18	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid total	-	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Grid 328, Level 14	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Backhoe, Grids: 99-127	-	3	-	-	-	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-
Grids: 43 and 71	1	6	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-
Grids: 267, 295, 323	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Stump No. 2	3	3	-	1	5	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Totals	58	271	19	12	54	3	6	14	-	-	26	194	15	5	3	2	6	-	16	1

Table 5.167. (continued)

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Site general/wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 51, Structural fl. 3	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 102, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 103, Fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 1	-	-	-	-	-	-	-	-	-	3	-	13	-
Layer 2	1	-	-	-	1	-	-	-	-	8	-	44	-
Layer 2, floor fill	-	-	-	-	-	-	-	-	-	-	1	18	-
Floor 1, association	-	-	-	-	-	-	-	-	-	1	-	13	-
Layer 3, floor fill	-	-	-	-	-	-	-	-	-	-	-	3	-
Floor 2, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 4, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 3, association	-	-	-	-	-	-	-	-	-	1	-	8	-
Layer 5, floor fill	-	-	-	-	-	-	-	-	-	1	-	3	-
Floor 4, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6, floor fill	-	-	-	-	-	-	-	-	-	1	-	1	-
Room total	1	-	-	-	1	-	-	-	-	15	1	-	107
Room 104, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	1	1
Room 107, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 109, Layer 1	-	-	-	-	-	-	-	-	-	-	-	4	-
Layers 2 and 3	-	-	-	-	-	-	-	-	-	-	1	2	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Layers 3 and 4, floor fill	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	-	-	-	-	-	-	1	-	9
Room 110, Layer 1	-	-	-	-	-	-	-	-	-	1	-	2	-
Layer 1, floor fill	-	-	-	-	-	-	-	-	-	-	-	3	-
Layer 2, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 1, contact	-	-	-	-	-	-	1	-	-	4	-	13	-
Floor 1, association	-	-	-	-	-	-	-	-	-	2	-	20	-
Layer 5 (surface 4)	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 7 (surface 6)	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 10, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	1	-	-	7	-	-	42
Room 112, Layer 2	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 3, floor fill	-	-	-	-	-	-	-	-	-	-	-	3	-
Floor 1, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 5	-	-	-	-	-	-	-	-	-	-	-	1	-

Table 5.167. (continued)

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Layer 5, floor fill	-	-	-	-	-	-	-	-	-	1	-	3	-
Layer 7	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	14
Room 119, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 127, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 135, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 137, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	2	2
Room 138, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 139, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 3	-	-	-	-	-	-	-	-	-	1	-	4	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6	1	-	-	-	-	-	-	-	-	-	-	2	-
Layer 6, floor fill	1	-	-	-	-	-	-	-	-	-	-	2	-
Layer 10, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 2, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	2	-	-	-	-	-	-	-	-	1	-	-	13
Room 142, Layer 3	-	-	-	-	-	-	-	-	-	-	-	5	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 5	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	4	-
Layer 6, floor fill	-	-	-	-	-	-	-	-	-	-	-	2	-
Floor 2, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	16
Room 143, Layer 1	-	-	-	-	-	-	-	-	-	-	-	5	-
Layer 2, floor fill	-	-	-	-	-	-	-	-	-	1	-	3	-
Floor 1, association	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 8, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 2, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	12
Room 145, Layer 7, floor fill	-	-	-	-	-	-	-	-	-	-	-	3	-
Floor 1, association	-	-	-	-	-	-	-	-	-	1	-	1	-
Layer 10, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	5
Room 146, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	1	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 5	-	-	-	-	-	-	-	-	-	-	-	1	-

Table 5.167. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Floor 3, association	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	1	-	-	-	-	-	-	-	-	-	-	7
Room 147, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	4	-
Layer 2, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 5, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	8
Room 150, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 152, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 153, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 166, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 173, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 177, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	5	5
Room 178, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 181, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 183, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	5	5
Room 186, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 188, Wall clearing	1	1	-	-	-	-	-	-	-	-	-	3	3
Room 193, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 197, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	3	3
Room 198, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 200, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	5	5
Room 201, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	1	1
Room 207, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	3	3
Room 208, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	3	3
Room 210, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	4	4
Room 212, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 213, Wall clearing	-	-	1	-	-	-	-	-	-	1	-	7	7
Room 215, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	5	5
Room 216, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	3	3
Room 218, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	3	3
Room 219, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 220, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 221, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Room 222, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	4	4
Room 229, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	3

Table 5.167. (continued)

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Room 230, Wall clearing	-	-	-	-	1	-	-	-	-	-	-	2	2
Room 232, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 233, Wall clearing	-	-	-	-	1	-	-	-	-	-	1	4	4
Room 236, Floor 3, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 4, association	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	3
Kiva 2, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	7	7
Kiva 5, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Kiva 6, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Kiva 7, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	2	2
Kiva 8, Wall clearing	-	-	-	-	2	-	-	-	-	-	-	6	6
Kiva 9, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Kiva 10, Level 14	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 17	-	-	-	-	-	-	-	-	-	-	1	3	-
Level 18	-	-	-	-	-	-	-	-	-	-	-	8	-
Level 19	-	-	-	-	-	-	-	-	-	-	-	4	-
Level 20	-	-	-	-	-	-	-	-	-	-	-	3	-
Level 21	-	-	-	-	-	-	-	-	-	1	-	1	-
Level 22	1	-	-	-	-	-	-	-	-	-	-	6	-
Level 23	1	-	-	-	-	-	-	-	-	-	-	2	-
Level 24	-	-	-	-	-	-	-	-	-	-	-	5	-
Level 25	-	-	-	-	-	-	-	-	-	-	-	5	-
Level 26	-	-	-	-	-	-	-	-	-	1	-	7	-
Level 27	-	-	-	-	-	-	-	-	-	1	-	4	-
Room total	2	-	-	-	-	-	-	-	-	3	1	-	51
Kiva 12, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Kiva 13, Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 5	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	3
Kiva 14, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	3	3
Kiva 15, Layer 1	-	-	-	-	-	-	-	-	-	1	1	4	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 4	-	-	-	-	-	-	-	-	-	1	-	1	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 7	1	-	-	-	-	-	-	-	-	-	-	7	-
Layer 7, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-

Table 5.167. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Wall construction	-	-	-	-	-	-	-	-	-	5	-	19	-
Room total	1	-	-	-	-	-	-	-	-	7	1	-	35
Kiva 16, Level 1	1	-	-	-	-	-	-	-	-	-	-	6	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	-	-	-	-	1	7	-
Room total	1	-	-	-	-	-	-	-	-	-	1	-	14
Kiva 17, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Circular structure 1, Wall clearing	1	-	-	-	-	-	-	-	-	-	-	3	3
Circular structure 2, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Plaza 1, General	-	-	-	-	-	-	-	-	-	-	-	4	4
Plaza Grid 8, Layer 1	-	-	-	-	-	-	-	-	-	1	-	2	-
Layer 2	-	-	-	-	-	-	-	-	-	1	-	2	-
Surface 2, association	-	-	-	-	-	-	-	-	-	-	-	1	-
Surface 4, fill (layer 9)	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 15	-	-	-	-	-	-	-	-	-	-	-	9	-
Grid total	-	-	-	-	-	-	-	-	-	2	-	-	15
Plaza Grid 9, Layer 4	-	-	-	-	-	-	-	-	-	1	-	2	2
25, Layer 1	-	-	-	-	-	-	-	-	-	1	-	1	1
29, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
30, Slump, 3 Other pit 1	-	-	-	-	-	-	-	-	-	-	-	4	4
35, Layer 1	-	-	-	-	-	-	-	-	-	-	-	4	-
Layer 2	-	-	-	-	-	-	-	-	-	1	-	1	-
Layer 3	-	-	-	-	-	-	-	-	-	1	-	5	-
Layer 4	1	-	-	-	-	-	-	-	-	-	-	1	-
Surface 4 association	-	-	-	-	-	-	-	-	-	-	-	4	-
Surface 8 association	-	-	-	-	1	-	-	-	-	-	-	1	-
Grid total	1	-	-	-	1	-	-	-	-	2	-	-	16
38, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	1
51, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	2
55, Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	1
Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	1
75, Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	1
Surface 1	-	-	-	-	-	-	-	-	-	-	-	2	2
95, Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	1
115, Layer 2	-	-	-	-	-	-	-	-	-	-	-	2	2
116, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	2

Table 5.167. (continued)

Provenience	Grooved Abraders 30	31	32	33	Polishing Stones 40	41	42	43	44	Anvils 50	52	Sub	Total
Layer 8	-	-	-	-	-	-	-	-	-	-	-	1	1
117, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
135, Layer 2	-	-	-	-	-	-	-	-	-	1	-	2	2
175, Layer 3, floor fill	-	-	-	-	-	-	-	-	-	1	-	1	1
Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	1
195, Layer 2	-	-	-	-	1	-	-	-	-	-	-	1	1
Surface 1	-	-	-	-	-	-	-	-	-	1	-	1	1
202, Layer 4	-	-	-	-	1	-	-	-	-	-	-	1	1
204, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
273, Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	1
Layer 4	-	-	-	-	-	-	-	-	-	1	-	2	2
Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	1
274, Layer 3	-	-	-	-	-	-	-	-	-	1	-	1	1
275, Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	1
280, Layer 3, floor fill	-	-	-	-	-	-	-	-	-	1	-	1	1
301, Layer 6	-	-	-	-	-	-	-	-	-	-	-	2	2
Surface 6	-	-	-	-	-	-	-	-	-	-	-	1	1
302, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 2, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	-	-	-	-	-	-	-	-	6
Plaza Grid 307, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 5	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 7	-	-	-	-	1	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	1	-	-	-	-	-	-	-	4
Major wall 1, Wall clearing	1	-	-	-	-	-	-	-	-	-	-	1	1
Major wall 2, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1
Major wall 3, Wall clearing	-	1	-	-	-	-	-	-	-	-	-	3	3
Major wall 4, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Major wall 6, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	1	1
Plaza feature 4, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Other structure 3, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	2
Layer 1	-	-	-	-	-	-	-	-	-	1	-	1	1
Other structure 4, Wall clearing	-	-	-	-	-	-	-	-	-	2	-	9	9
Other structure 5, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	1	1

Table 5.167. *(continued)*

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Other structure 6, Wall clearing	-	-	-	-	-	-	-	-	-	3	-	33	33
Other structure 7, Wall clearing	1	-	-	-	-	-	-	-	-	-	-	9	9
Other structure 8, Wall clearing	-	1	-	-	-	-	-	-	-	1	-	5	5
Other structure 9, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	3	3
Other structure 11, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	4	4
Other structure 12, Wall clearing	-	-	-	1	-	-	-	-	-	1	-	8	8
Plaza feature 1	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 1, Layer 2	-	-	-	-	-	-	-	-	-	1	-	3	3
Room 3, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 3	-	-	-	-	2	-	-	-	-	1	-	10	-
Layer 3, floor fill	-	-	-	-	-	-	-	-	-	1	-	1	-
Layer 4, floor fill	1	-	-	-	-	-	-	-	-	-	-	3	-
Floor 1, association	-	-	-	-	-	-	-	-	-	-	1	2	-
Replasters 2-4	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	1	-	-	-	2	-	-	-	-	2	1	-	18
Room 4, Layer 2	-	-	-	-	-	-	-	-	-	1	-	6	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 12, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	8
Room 5, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
East Ruin, Room 14, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 2	-	-	-	-	1	-	-	-	-	-	-	2	-
Layer 2, floor fill	-	-	-	-	1	-	-	-	-	1	-	5	-
Floor 1, association	-	-	-	-	1	-	-	-	-	-	-	2	-
Room total	-	-	-	-	3	-	-	-	-	1	-	-	10
Plaza 2, Grid 5, Layer 4	-	-	-	-	-	-	-	-	-	1	-	1	-
161, Layer 2, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
181, Layer 2, floor fill	1	-	-	-	-	-	-	-	-	-	-	2	-
Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	-
182, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 2, floor fill	1	-	-	-	-	-	-	-	-	-	-	1	-
201, Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	-
221, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Surface 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Plaza 2 total	2	-	-	-	-	-	-	-	-	1	-	-	12

Table 5.167. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Parking Lot Ruin	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 1, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 4, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	1	1
Trash Mound	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 52, Surface	-	-	-	-	-	-	-	-	-	-	-	1	-
Fill	-	-	-	-	-	-	-	-	-	-	-	2	-
Grid total	-	-	-	-	-	-	-	-	-	-	-	-	3
Grid 53, Layer 3	-	-	-	-	-	-	-	-	-	-	-	5	-
Layer 4	-	-	-	-	-	-	-	-	-	1	-	3	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 10	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 16	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	-	-	-	-	-	1	-	-	11
Grid 54, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 9	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 15	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 16	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 17	-	-	-	-	-	-	-	-	-	-	-	5	-
Grid total	-	-	-	-	-	-	-	-	-	-	-	-	11
Grid 55, Layer 3	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 5	-	-	-	-	-	-	-	-	-	-	-	3	-
Layer 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 17	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 19	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 21	-	-	-	-	-	-	-	-	-	-	-	2	-
Grid total	-	-	-	-	-	-	-	-	-	-	-	-	10
Grid 56, Layer 96	1	-	-	-	-	-	-	-	-	-	-	1	-
Layer 103	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 113	-	-	-	-	-	-	-	-	-	-	-	2	-
Grid total	1	-	-	-	-	-	-	-	-	-	-	-	4
Grid 70, Level 2	-	-	-	-	-	-	-	-	-	-	-	3	-
Level 4	-	-	-	-	-	-	-	-	-	1	-	2	-
Layer 10	-	-	-	-	-	-	-	-	-	1	-	1	-
Grid total	-	-	-	-	-	-	-	-	-	2	-	-	6
Grid 127, Layer 5	-	-	-	-	-	-	-	-	-	-	-	1	1
Grid 155, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-

Table 5.167. (continued)

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Level 9	-	-	-	-	-	-	-	-	-	-	1	1	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	-	-	-	-	-	-	1	-	4
Grid 163, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	1
Grid 183, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	1	-	-	-	-	-	-	-	-	-	-	2	-
Level 4	1	-	-	-	-	-	-	-	-	-	-	2	-
Level 7	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 9	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 11	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 13	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	2	-	-	-	-	-	-	-	-	-	-	-	12
Grid 211, Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 6	-	-	-	-	-	-	-	-	-	1	-	2	-
Level 9	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 12	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 17	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	-	-	-	-	-	1	-	-	8
Grid 239, Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 5	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 7	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 10	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 11	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 13	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 17	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 19	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	-	-	-	-	-	-	-	-	15
Grid 26, Level 6	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 14	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 15	-	-	-	-	-	-	-	-	-	-	-	1	-

Table 5.167. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Level 17	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 18	-	-	-	-	-	-	-	-	-	-	1	1	-
Grid total	-	-	-	-	-	-	-	-	-	-	1	-	8
Grid 295, Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 8	-	-	-	-	-	-	1	-	-	-	-	1	-
Level 10	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 12	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 13	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 16	-	-	-	-	-	-	-	-	-	-	1	1	-
Level 17	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid total	-	-	-	-	-	-	1	-	-	-	1	-	9
Grid 323, Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 12	-	-	-	-	-	-	-	-	-	-	1	1	-
Level 14	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 16	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 18	-	-	-	-	-	-	-	-	-	1	-	2	-
Grid total	-	-	-	-	-	-	-	-	-	1	1	-	6
Grid 328, Level 14	-	-	-	-	-	-	-	-	-	-	-	1	1
Backhoe, Grids: 99-127	-	-	-	-	-	-	-	-	-	-	-	6	6
Grids: 43 and 71	-	-	-	-	-	-	-	-	-	3	1	14	14
Grids: 267, 295, 323	-	-	-	-	-	-	-	-	-	-	-	3	3
Stump No. 2	-	-	-	-	2	-	-	-	-	-	-	16	16
Totals	18	4	1	1	17	-	2	-	-	79	12	-	839

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abrader.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.168. A comparison of abraders from Gallup and Chaco-McElmo trash.

	Active Abraders											Passive Abraders								
Number/Percent	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Gallup:																				
Trash Mound, Grid 53	2	2	1	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	1	-
	18	18	9	-	-	-	-	-	-	-	-	36	-	-	-	-	-	-	9	-
Grid 54	5	4	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
	45	37	-	-	-	-	-	9	-	-	-	9	-	-	-	-	-	-	-	-
Grid 55	2	4	-	-	2	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
	20	20	-	-	20	-	-	-	-	-	-	10	10	-	-	-	-	-	-	-
Grid 183	1	7	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
	8	58	-	-	-	-	-	-	-	-	-	17	-	-	-	-	-	-	-	-
Grid 211	-	2	1	1	1	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
	-	25	12	12	12	-	-	-	-	-	-	25	-	-	-	-	-	-	-	-
Grid 239	2	7	1	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-	-	-
	13	47	6	-	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	-
Total	12	26	2	2	3	-	-	1	-	-	-	15	-	1	-	-	-	-	1	-
	18	39	3	3	4	-	-	1	-	-	-	22	-	1	-	-	-	-	1	-
Chaco-McElmo:																				
Kiva 10	1	21	1	2	2	2	2	1	-	-	-	9	-	2	-	-	1	-	1	-
	2	41	2	4	4	4	4	2	-	-	-	18	-	4	-	-	2	-	2	-
Kiva 16	2	2	-	-	-	1	-	-	-	-	-	7	-	-	-	-	-	-	-	-
	14	14	-	-	-	7	-	-	-	-	-	50	-	-	-	-	-	-	-	-
Totals	3	23	1	2	2	3	2	1	-	-	-	16	-	2	-	-	1	-	1	
	5	35	1	3	3	5	3	1	-	-	-	29	-	3	-	-	1	-	1	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.168. (continued)

	Grooved Abraders				Polishing Stones					Anvils		
Number/Percentage	30	31	32	33	40	41	42	43	44	50	52	Total
Gallup:												
Trash Mound, Grid 53	-	-	-	-	-	-	-	-	-	1	-	11
	-	-	-	-	-	-	-	-	-	9	-	-
Grid 54	-	-	-	-	-	-	-	-	-	-	-	11
	-	-	-	-	-	-	-	-	-	-	-	-
Grid 55	-	-	-	-	-	-	-	-	-	-	-	10
	-	-	-	-	-	-	-	-	-	-	-	-
Grid 183	2	-	-	-	-	-	-	-	-	-	-	12
	17	-	-	-	-	-	-	-	-	-	-	-
Grid 211	-	-	-	-	-	-	-	-	-	1	-	8
	-	-	-	-	-	-	-	-	-	12	-	-
Grid 239	-	-	-	-	-	-	-	-	-	-	-	15
	-	-	-	-	-	-	-	-	-	-	-	-
Total	2	-	-	-	-	-	-	-	-	2	-	67
	3	-	-	-	-	-	-	-	-	3	-	-
Chaco-McElmo:												
Kiva 10	2	-	-	-	-	-	-	-	-	3	1	51
	4	-	-	-	-	-	-	-	-	6	2	-
Kiva 16	1	-	-	-	-	-	-	-	-	-	1	14
	7	-	-	-	-	-	-	-	-	-	7	-
Totals	3	-	-	-	-	-	-	-	-	3	2	65
	5	-	-	-	-	-	-	-	-	5	3	

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

artifacts used in wall construction, which presumably most wall clearing rocks would represent, would be helpful. It is not likely that the better made, complete artifacts would be those found in wall-fall.

Extensive use of abraders was not common at Pueblo Alto; in fact, it shares with 29SJ 629 the distinction of having very low frequencies of extensively used abraders, 0.4 percent.

Secondary use was found in 31.2 percent of the cases, at the low end of the scale. Only Una Vida and 29SJ 633 had lower percentages. These are our three latest sites, suggesting that secondary use declines over time, but these sites are low in polisher frequencies which could account for much of the difference.

<u>29SJ 390 (Rabbit Ruin)</u>

Rabbit Ruin is a small McElmo Phase site located 260 m north of Pueblo Alto. The walls were outlined in 1976 (Windes 1976d) to determine its architectural configuration. One tree-ring specimen from the site had a cutting date of A.D. 1088.

Three abraders were recovered from the site. This is too small of a sample to generalize about the site. The provenience information for the site can be found in Table 5.169.

<u>29SJ 391 (Una Vida)</u>

Una Vida is one of the large Bonito Phase "town" (greathouse) sites located on the north side of the canyon floor near the Visitors Center. Fifteen contiguous rooms in the north corner were excavated in 1960 by R. Gordon Vivian, then recleared and further excavated in the winter of 1978-1979 (Akins and Gillespie 1979). The site is a large classic greathouse with around one hundred ground floor rooms. The excavated portion was mainly "early Bonito" construction but was used through the latest occupation. The materials removed by Vivian were from the room fill and the last Anasazi occupation of the site, while the second excavation included materials associated with Red Mesa Black-on-white ceramics through late ceramic materials.

Many of the artifacts excavated by Vivian were located and included in this analysis. Adding these artifacts biased the sample because many were "choice museum specimens" and objects kept because they resembled manos. In general, everything above the first floors was from Vivian's excavation. Even though we have the field catalogs from his excavation, the crews did not screen and were working very fast with minimal supervision. For that reason his assemblages should be viewed with caution. Fifty-five (65 percent) of the abraders in this sample are from Vivian's excavation.

A total of 86 abraders were analyzed from Una Vida. Of these 87.7 percent were complete, a figure strongly influenced by Vivian's collection strategy. Table 5.170 gives provenience information for the abraders.

<u>Room 21.</u> This unusually large two-story room may have functioned as an early habitation room. Vivian cleared the lower floor but missed several depressions and features in the floor. His excavations recovered 20 hammerstones, four polishing stones, 45 manos, nine metate fragments and two whole metates, eight other ground stones, and two concretions (Vivian 1960). The catalog noted that these stone objects were found from the floor to one foot above the floor in the level of a fallen and partially burned ceiling. This suggests that the mass of stone was stored in the second story room. The only floor contact abrader was recovered by our excavation.

<u>Room 23.</u> Artifactually, this is an interesting room; unfortunately, Vivian made no notes on it. It was constructed slightly later than other rooms in the early section and was a habitation room complete with a large central firepit and several heating pits. Over a hundred tiny bits of turquoise and two shell bracelet fragments were found while washing sherds from the room fill. More turquoise and shell inlays were found when reclearing the floor. Five projectile points were recovered from the first floor. The only two "lightning stones" found in Chaco Canyon were recovered from either this room or Room 64. Vivian had originally written Room 23 in his catalog then crossed this out and wrote 64. The catalog numbers assigned were much earlier than those for the fill of Room 64 and the site photographs indicated that the floor of Room 23 was cleared before Room 64 had been excavated very far. They are quite close to the catalog sequence for Room 23. In either case Room 64 is the storage room behind and connected to Room 23. Only one lapidary stone was recovered or kept

Table 5.169. 29SJ 390 abraders.

Provenience	Active Abraders										Passive Abraders								
	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room 10, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 11, Wall clearing	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Provenience	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Room 10, Wall clearing	-	-	-	-	-	-	-	-	-	1	-	1	-
Room 11, Wall clearing	-	-	-	-	-	-	-	-	-	-	-	2	-
Totals	-	-	-	-	-	-	-	-	-	1	-	-	3

10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Point shapers.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual rock abrader.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.170. Una Vida abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room 18, Fill	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 1	-	1	1	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Floor fill, layer 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	2	1	-	2	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Room 19, Floor 1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 21, Floor fill, layer 2	-	11	-	-	2	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-
Floor	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room total	-	11	-	-	2	-	-	-	-	-	2	4	-	-	-	-	-	-	-	-
Room 23, Floor fill, layer 2	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 1	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 features	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 features	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	2	7	-	1	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 45, Floor 1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Room 60, Floor 2 features	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 63, Floor fill, layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Layer 3, floor fill	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1	-	-	-	-	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Room total	1	-	-	-	1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-
Room 64, Floor 1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Room 82, Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 83, Layer 1	-	-	-	1	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Layer 2	-	4	-	-	1	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Floor fill, layer 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 features	-	-	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Floor 4 features	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	5	1	1	3	-	-	-	-	-	1	4	-	1	-	-	-	-	-	-
Room 84, Floor fill, layer 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 features	-	7	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-
Room total	-	8	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-
Totals	3	36	2	3	8	-	-	-	-	-	8	14	1	1	-	-	-	-	-	-

Table 5.170. *(continued)*

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Room 18, Fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 1	-	-	-	-	-	-	1	-	-	-	-	6	-
Floor fill, layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	1	-	-	-	-	-	8
Room 19, Floor 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 21, Floor fill, layer 2	-	-	-	-	-	-	-	-	-	2	-	20	-
Floor	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	2	-	-	21
Room 23, Floor fill, layer 2	-	-	-	-	-	-	-	-	-	-	-	2	-
Floor 1	-	-	-	-	-	-	-	-	2	-	-	5	-
Floor 1 features	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 2 features	-	-	-	-	-	-	-	-	-	1	-	6	-
Room total	-	-	-	-	-	-	-	-	2	1	-	-	14
Room 45, Floor 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 60, Floor 2 features	-	-	-	-	-	-	-	-	-	-	-	3	3
Room 63, Floor fill, layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 3, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 1	-	-	-	-	-	-	-	-	-	1	-	4	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	6
Room 64, Floor 1	-	-	-	-	-	-	-	-	-	1	-	2	2
Room 82, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 83, Layer 1	-	-	-	-	-	-	-	-	-	-	-	4	-
Layer 2	-	-	-	-	-	-	-	-	-	1	-	9	-
Floor fill, layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 1 features	-	-	-	-	-	-	-	-	-	-	-	2	-
Floor 4 features	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	17
Room 84, Floor fill, layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 2 features	-	-	-	-	-	-	-	-	-	1	-	11	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	12
Totals	-	-	-	-	-	-	1	-	2	7	-	-	86

Table 5.170. (continued)

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abrader.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

by Vivian from this room, but the area was surely a lapidary workshop.

Room 83. Room 83 had more abraders than any other room excavated at the site. It is a small square room which may have functioned as a kiva or clan room for its last use. Testing below the floor revealed earlier wall foundations and plaza surfaces. The eleven abraders from the fill were recovered by Vivian. He reported many others in the catalog, but they were not kept. Those included four hammerstones, four polishing stones, 17 manos, three metates, and one ground stone.

Other Observations. The other rooms have too few abraders to describe. The nature of the excavations at Una Vida do not give us good contextual or functional information. There are some interesting abraders, the lightning stones, two sandal lasts, and many nicely made slabs that were analyzed; however, Vivian's sampling strategy for museum collections must be kept in mind when reviewing the site trends which follow.

There are anomalies in the numbers of abraders found at Una Vida. The percentage of undifferentiated active abraders is second only to 29SJ 633. It would be difficult to say whether this is due to the lateness of the site's occupation or to Vivian's sampling strategy. There is also a large percentage of manolike abraders, 9.3 percent, which is most likely a result of the sampling; Vivian kept almost all of the complete "manos" recovered. There were three times as many abrader-anvils as found in any other site. These were scattered throughout six of the rooms. The number of passive abraders is low but this too, could be a sampling error. No palettes of any kind were found, but 30.2 percent of the other abraders had some sort of pigment staining. The absence of polishers might appear unusual except that they were quite often noted in the catalog but were not kept. The anvil percentages are low but are similar to Pueblo Alto, 29SJ 629, and 29SJ 1360, so they may be reasonable.

As was noted earlier, 83.7 percent of the abraders were complete. This is suspect given the sampling strategy. A check of the 31 recovered from our excavations found that 26 or 83.8 percent of those were complete. It is doubtful that this would hold for the whole site; our excavations on floors and features are expected to produce more complete artifacts than room fill or trash deposits.

Una Vida has the highest percentage of abraders with previous forms found in our sample, 45.5 percent; this is followed by 29SJ 633 with 29.0 percent. Thirty-four of the 39 were originally manos; again this may have been due to Vivian's less than random collecting strategy. Ten or 32.2 percent of those we excavated were previously manos.

Manufacture is fairly normal, except that Una Vida has the highest number of extensively modified artifacts in the sample, 8.1 percent of the total or 23.3 percent of those that were modified. This is reasonable, given the collection, but probably not representative of the site as a whole. The number of abraders with a secondary use is quite low, 22.1 percent, but not as low as either 29SJ 627 or 29SJ 628.

It is difficult to say much of anything about the site that has been subjected to "museum selection" for its cataloged objects. Even though National Park Service policy is to retain a representative sample, this is rarely done, especially with respect to ground stone.

29SJ 423

29SJ 423 is a Basketmaker III site located on a long promontory on the south side of the canyon and overlooking Peñasco Blanco. Excavation was carried out in the summer of 1973 under the direction of Thomas C. Windes (1975). Two small semi-subterranean chambers, a great kiva, a ramada, some trash areas, and several cists were excavated. The main occupation of the site was during the sixth century A.D. with later Pueblo III intrusions.

Thirty-nine abraders were recovered and analyzed from this site; 66.7 percent were complete. Provenience information can be found in Table 5.171.

Pithouse A. Although labeled a pithouse, at best, this structure was a seasonal use area which was possibly roofed. One of the abraders was found in the Basketmaker III trash in the structure. The other two were higher up and could have been associated with the late Pueblo III wall and shrine placed over the structure.

Table 5.171. 29SJ 423 abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Pithouse A, Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trash, level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse B, Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Great Kiva, Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Between outer wall slabs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 association	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 association	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-
Floor 3 association	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	-	-	-	-	-	-	-	-	-	-	3	1	-	-	-	-	-	-	-
Ramada 1, Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 1	-	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Total	-	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Cist 2 Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Backdirt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals	3	3	-	-	-	-	-	-	-	-	-	5	1	-	-	-	-	-	-	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abrader.
18 = An unusual abrader rock.

19 = Abrader-anvils
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.171. *(continued)*

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Pithouse A, Surface	-	-	-	-	-	-	1	-	-	-	-	1	-
Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Trash, level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	1	-	-	-	-	-	3
Pithouse B, Level 1	-	-	-	-	-	-	-	-	-	1	-	2	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-		-	1	-	-	3
Great Kiva, Surface	-	-	-	-	-	1	1	-	-	-	-	2	-
Level 1	-	-	-	-	-	2	1	-	-	-	-	3	-
Level 2	-	-	-	-	3	-	1	-	-	-	-	5	-
Level 3	-	-	-	-	1	-	-	-	-	-	-	2	-
Between outer wall slabs	-	-	-	-	1	-	-	-	-	-	-	1	-
Floor 1 association	-	-	-	-	1	1	-	-	-	-	-	2	-
Floor 2 association	-	-	-	-	2	-	-	-	-	-	-	5	-
Floor 3 association	-	-	-	-	-	1	-	-	-	-	-	1	-
Room total	-	-	-	-	8	5	3	-	-	-	-	-	21
Ramada 1, Surface	-	-	-	-	3	-	-	-	-	-	-	3	-
Level 1	-	-	-	-	3	-	-	-	-	-	-	6	-
Total	-	-	-	-	6	-	-	-	-	-	-	-	9
Cist 2 Fill	-	-	-	-	1	-	-	-	-	1	-	2	2
Backdirt	1	-	-	-	-	-	-	-	-	-	-	1	1
Totals	1	-	-	-	15	5	4	-	-	2	-	-	39

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

<u>Pithouse B.</u> Possibly a pithouse, this small trash-filled structure contained three abraders in its fill.

<u>Great Kiva.</u> The bulk of the abraders (21) came from this structure, 12 were from the fill. The abraders found in association were generally incorporated into the bench construction. Only the pot polisher was found in context. Unfortunately, few artifacts represent the final use of the great kiva.

<u>Other Observations.</u> Although 29SJ 423 had a small number of abraders and was not a typical habitation site, the trash fill was probably representative of Basketmaker trash, most probably from pithouses nearby. The site, as a whole, is very similar to other Basketmaker sites in the sample. The percentage of active abraders is small and that of the polishers is large; in fact, they comprise 53.6 percent of the abrader population. It also has a low number of anvils.

The percentage of burned abraders is low for a Basketmaker III site, only 12.8 percent, the second lowest found. There is a variety of cobble materials represented with two metamorphic, one chert, and 20 quartzite cobbles.

29SJ 423 had the lowest percentage of abraders with previous forms, but considering that over half of these were cobbles, this may not be significant. Four abraders did have mano "previous forms." The site is second only to 29SJ 633 in the number of abraders with no modification, but again this is influenced by the large number of polishers. The high percentage of secondary use (51.3 percent) is also attributable to the polishers. Overall, there is nothing in this site that sets it apart from the other Basketmaker III sites or habitation sites in general.

<u>29SJ 627</u>

This multicomponent site is located in Marcia's Rincon on the south side of the canyon and west of the Visitors Center. Excavation was carried out during the summers of 1974 and 1975 under the direction of Marcia Truell (1980, 1992). Twenty rooms and five-and-a-half kivas were excavated as well as several areas in the plaza and trash. The occupation spanned 300 years from late Basketmaker III to Pueblo III times.

Because of the complex nature of the site and the large number of abraders, it was necessary to deal only with those from good contexts. Five hundred abraders were recovered from the site, 75.6 percent were complete. Several other abraders were left at the site when ground stone began to fill our storage area to capacity. Those which still retained the FS numbers were later retrieved and analyzed. Provenience information can be found in Table 5.172. Proveniences from this site will follow the sequence in which they appear in the report (Truell 1980), beginning with the earliest occupation and going to the latest.

<u>Roomblock Construction Episode 1.</u> Very few of these proveniences had primary context abraders. Only one storage room had an abrader associated with it. The remainder were from ramada surfaces found below the floors of later rooms.

<u>Room 5, Floor 2</u>. This area had features suggesting that it functioned as a habitation or work area. The abraders are consistent with the assemblages that are found in Basketmaker III pithouses; see Table 5.173.

<u>Room 7, Floor 2</u>. A pile of stones that the excavator thought was a cache was recovered from this room. Of these eight, only two were complete, suggesting non-primary context or curation for building or other purposes.

<u>Room 10, Floor 2</u>. Two abraders were found on this early ramada surface—one was a faceted abrader and one was a polisher. A paint grinder and passive abrader were also found built into a bin wall.

In general, the earliest proveniences are consistent with other Basketmaker III to early Pueblo I assemblages. The percentage of active abraders is about equal to the polishers. There are more passive abraders than expected, but most are floor artifacts, an assemblage that should be different from the site as a whole.

<u>Roomblock Construction Episode 2.</u> At this time, the site consisted of seven storage rooms, four ramada areas, and two pithouses. Table 5.173 records the abraders from this second construction phase that were found in primary context. Few proveniences had enough abraders for generalization.

Table 5.172. 29SJ 627 abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Test trench 3, Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Test trench 4, Fill	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 5, Fill	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	1	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Test trench 7, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Test trench 9, Level 2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 10, Burial 3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 13, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 17, Level 1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Test trench 20, Level 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 35	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse B, Clearing	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
(Test trench 11) Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
(Test trench 11) Level 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1, central pit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Pithouse C, Clearing	2	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Fill	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 5	1	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 7	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
SW Test trench	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balk 1, Layer E	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balk 1, Layer F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balk 1, Floor fill F	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balk 1, Layer A[1]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.172. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Floor fill 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balk 3, Layer B	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1	2	3	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Wing wall Floor 1	1	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Vent Tunnel fill	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room total	7	14	1	-	-	2	-	-	-	-	2	1	6	-	-	-	-	-	-	-
Room 1, Floor 2 fill, level 5	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Burial 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 2, Level 3	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Level 5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 contact	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Room 3, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Subfloor level 1	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Room total	-	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-
Room 4, Level 3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 4	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor contact	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Storage cist 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subfloor layer 1	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	-	-
Subfloor layer 2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room total	1	4	-	-	-	-	-	-	-	-	1	-	1	1	-	-	-	-	-	-
Room 5, Level 1	-	2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Level 2	-	5	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 3	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Floor 1, contact	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Subfloor level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pit 11 (posthole)	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	3	8	-	-	-	1	-	-	-	-	-	2	1	2	-	-	-	-	-	-
Room 6, Level 1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 4	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

Table 5.172. (continued)

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room total	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 7, Wall construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Subfloor 1, level 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 2 contact	2	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Floor 2 firepit	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	3	1	-	-	-	-	-	-	-	-	-	3	1	1	-	-	-	1	-	-
Room 8, Level 2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1, contact	-	1	-	1	-	-	-	-	1	-	1	-	-	-	-	-	1	-	-	-
Floor 2, contact	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Firepit 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pit 1 (posthole)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tool storage	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 3 contact	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Subfloor 2, layer 2	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
East wall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	4	-	1	-	-	-	-	1	-	1	3	1	-	-	-	1	-	-	-
Room 9, Level 6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 contact	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 10	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subfloor 3 test	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 10, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 replaster	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subfloor layer 1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 fill	3	5	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Floor 2 contact	-	-	1	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
Room total	3	5	2	-	-	-	1	-	-	-	1	2	-	-	-	-	-	-	-	-
Room 11, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 12, Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.172. *(continued)*

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room total	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 13, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Room 14, Level 1	-	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 contact	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room total	-	2	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Room 15, Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 16, Level 1	1	1	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Floor 3 feature 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subfloor 3 layer 3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Room total	1	1	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	-	-
Room 17-18, Level 1	-	1	-	-	-	-	-	-	-	1	1	-	1	-	-	-	-	-	-	-
Level 2	-	1	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-
Floor 1 contact	1	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-	-
Wall construction	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room total	1	2	-	-	-	-	-	-	-	1	1	2	7	1	-	-	-	-	-	-
Room 19, Level 1	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 5	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Levels 4 and 5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cist SE corner	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	2	7	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-
Room 20, Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 21, Surface 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 22, Surface	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Level 1, Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.172. *(continued)*

Provenience		Active Abraders											Passive Abraders								
		10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
	Subfloor Level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Subfloor Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Room total	-	3	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	-	-
Room 23,	Test trench 36, Layer 1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 1	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Floor 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bin 1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Room total	1	2	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Room 25,	Level 1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Kiva D,	Clearing above	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Test trench 25, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Level 2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Level 3	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 9	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Balk 1, microst. 1	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Level 1	-	2	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-
	Level 4	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 5	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 6	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 8	-	3	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Level 9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 10	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	F. f. Level 11	1	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Floor 1 contact	3	4	-	1	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
	Firepit 1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Bin 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vent chinking	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Pithouse A antechamber fill	2	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	13	22	3	1	-	-	2	-	-	-	1	2	1	6	-	-	-	-	-	-
Kiva E,	Test trench 29	-	2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Test trench 37, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Layer 3A	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-

Table 5.172. (continued)

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Layer 3B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Balk 1, Layer 5	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Floor 1 contact	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Firepit 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern recess	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Room total	-	4	-	1	-	-	-	1	-	-	1	-	1	3	-	-	-	-	-	-
Kiva F, Test trench 34 Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 5	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 6	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subfloor vent	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	3	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kiva G, Level 6	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Levels 9 and 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 contact	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Vent tunnel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Plaza, General	2	2	1	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-
Cist 10	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cist 12	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
East of Kiva D	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trench S of room 20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	3	6	1	-	-	-	-	1	-	-	-	1	1	-	-	-	-	-	-	-
Ramada East of room 14, Fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 1	-	-	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	1	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-
Trash Mound, Test trench 1, Level 1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 2, Level 1	2	4	1	-	-	1	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Level 2	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 1 EL2, Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.172. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FL2, Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GL2, Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HR1, Layer 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
JL1, Level 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KL1, Level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KL2, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
KX, Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trash total	7	8	1	-	-	2	-	-	-	-	1	1	1	1	-	-	-	-	-	-
Totals	60	119	11	3	-	6	3	4	1	1	14	26	30	22	-	-	1	1	-	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Test trench 3, Level	-	-	-	-	-	-	-	1	-	-	-	3	3
Test trench 4, Fill	-	-	-	-	-	1	-	-	-	-	-	2	2
Test trench 5, Fill	-	-	-	-	2	-	-	-	-	-	-	9	-
Level 1	-	-	-	-	2	-	-	-	-	-	-	2	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Total	-	-	-	-	4	-	-	-	-	-	-	-	12
Test trench 7, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Test trench 9, Level 2	-	-	-	-	1	-	-	-	-	-	-	3	3
Test trench 10, Burial 3	-	-	-	-	1	-	-	-	-	-	-	3	3
Test trench 13, Level 1	-	-	-	-	1	-	-	-	-	-	-	1	-
Level 2	-	-	-	-	1	-	-	-	-	-	-	1	-
Total	-	-	-	-	2	-	-	-	-	-	-	-	2
Test trench 17, Level 1	-	-	-	-	-	-	-	-	-	-	-	2	2
Test trench 20, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	1
Test trench 35	-	-	-	-	-	-	-	-	-	-	-	1	1
Pithouse B, Clearing	-	-	-	-	-	-	-	-	-	-	-	2	-
(Test trench 11) Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
(Test trench 11) Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	1	-	-	-	-	2	-
Floor 1, central pit	-	-	-	-	-	-	1	-	-	-	-	1	-
Room total	-	-	-	-	-	-	2	-	-	-	-	-	7
Pithouse C, Clearing	-	-	-	-	4	2	-	-	-	-	-	11	-
Fill	-	-	-	-	1	-	-	1	-	-	-	3	-
Level 1	-	-	-	-	1	-	-	-	-	-	-	2	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 4	-	-	-	-	1	-	-	-	-	-	-	1	-
Level 5	-	-	-	-	1	-	-	-	-	-	-	4	-
Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 7	-	-	-	-	-	-	-	-	-	-	-	1	-
SW Test trench	-	-	-	-	-	-	-	-	-	1	-	2	-
Balk 1, Layer E	-	-	-	-	-	-	-	-	-	-	-	1	-
Balk 1, Layer F	-	-	-	-	1	-	-	1	-	-	-	2	-
Balk 1, Floor fill F	-	-	-	-	1	2	-	-	-	2	-	10	-
Balk 1, Layer A	-	-	-	-	1	-	1	-	-	-	-	2	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Floor fill 10	-	-	-	-	-	-	-	-	-	1	-	1	-
Balk 3, Layer 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 1	-	-	1	-	1	-	1	-	-	3	1	15	-
Wing wall Floor 1	-	-	-	-	-	-	-	-	-	1	-	5	-
Vent Tunnel fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	1	-	13	4	2	2	-	8	1	-	64
Room 1, Floor 2 fill, level 5	-	-	-	-	-	-	-	-	-	-	-	2	-
Burial 1	-	-	-	-	1	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	-	-	-	-	-	-	-	3
Room 2, Level 3	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 5	-	-	-	-	-	-	-	-	-	-	1	2	-
Floor 2 contact	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	-	1	-	5
Room 3, Level 1	-	-	-	-	-	-	-	-	-	1	-	1	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Subfloor level 1	-	-	-	-	-	-	-	-	-	1	-	3	-
Room total	-	-	-	-	-	-	-	-	-	2	-	-	5
Room 4, Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	2	-
Floor contact	-	-	-	-	-	-	-	-	-	-	-	1	-
Storage cist 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Subfloor layer 1	-	-	-	-	-	-	-	-	-	1	-	3	-
Subfloor layer 2	-	-	-	-	-	-	-	-	-	1	-	2	-
Room total	-	-	-	-	-	-	-	-	-	2	-	-	10
Room 5, Level 1	-	-	-	-	-	-	-	-	-	1	-	5	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	7	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	3	-
Floor 1, contact	-	-	-	-	-	-	-	-	-	5	-	7	-
Subfloor level 1	-	-	-	-	-	1	-	-	-	-	-	1	-
Floor 2 contact	-	-	-	-	1	-	2	-	-	1	-	4	-
Pit 11 (p.h.)	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	1	2	-	-	7	-	-	28
Room 6, Level 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 4	-	-	1	-	-	-	-	-	-	-	-	3	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Room total	-	-	1	-	-	-	-	-	-	-	-	-	5
Room 7, Wall construction	-	-	-	-	-	-	-	-	-	1	-	1	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	-	-	-	1	-	2	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	1	-
Subfloor 1, level 1	-	-	-	-	-	-	1	-	-	1	-	3	-
Floor 2 contact	-	-	-	-	1	-	-	-	-	-	1	7	-
Floor 2 firepit	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	-	1	-	-	3	1	-	16
Room 8, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	1	-	-	-	-	1	-
Floor 1, contact	-	-	-	-	-	-	-	-	-	2	-	7	-
Floor 2, contact	-	-	-	-	-	1	-	-	-	-	1	3	-
Firepit 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Pit 1 (pithouse)	-	-	-	-	-	-	-	-	-	1	-	1	-
Tool storage	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 3 contact	-	-	-	-	-	-	-	-	-	-	-	1	-
Subfloor 2, layer 2	1	-	-	-	1	-	-	-	-	-	-	4	-
East wall	-	-	-	-	-	-	-	-	-	-	1	1	-
Room total	1	-	-	-	1	1	1	-	-	3	2	-	21
Room 9, Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 2 contact	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 10	-	-	-	-	-	-	1	-	-	-	-	2	-
Subfloor 3 test	-	-	-	-	-	-	1	-	-	-	-	1	-
Room total	-	-	-	-	-	-	2	-	-	-	-	-	5
Room 10, Level 1	-	-	-	-	-	-	-	-	-	1	-	1	-
Floor 2 replaster	-	-	-	-	-	-	-	-	-	1	-	1	-
Subfloor layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 2 fill	-	-	-	-	-	-	-	-	-	-	-	10	-
Floor 2 contact	-	-	-	-	1	-	-	-	-	-	-	4	-
Room total	-	-	-	-	1	-	-	-	-	2	-	-	17
Room 11, Level 1	-	-	-	-	-	-	-	-	-	1	-	1	1
Room 12, Level 1	-	-	-	-	-	-	1	-	-	1	-	3	-
Level 2	-	-	-	-	1	-	-	-	-	-	-	1	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Room total	-	-	-	-	1	-	1	-	-	1	-	-	4
Room 13, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 14, Level 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 2	-	-	-	-	-	-	-	-	-	1	-	1	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	-	-	-	-	-	1	-	-	5
Room 15, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 2	-	-	-	-	1	-	-	-	-	1	-	3	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	-	-	-	-	1	-	-	5
Room 16, Level 1	-	-	-	-	-	-	-	-	-	-	-	4	-
Level 2	-	-	-	-	-	-	1	-	-	-	-	1	-
Floor 1 contact	-	-	-	-	-	-	1	-	-	1	-	3	-
Floor 3 feature 6	-	-	-	-	-	-	-	-	-	-	1	1	-
Subfloor 3 layer 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	2	-	-	1	1	-	10
Room 17-18, Level 1	-	-	-	-	-	1	-	-	-	-	1	6	-
Level 2	-	-	-	-	-	1	-	-	-	1	-	6	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	3	-	8	-
Wall construction	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	1	-	-	-	4	1	-	21
Room 19, Level 1	-	-	-	-	-	-	-	-	-	-	-	3	-
Level 2	-	-	-	-	-	-	-	-	-	1	-	3	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 5	-	-	-	-	-	-	-	-	-	2	-	3	-
Levels 4 and 5	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 1	-	-	-	-	-	-	-	-	-	1	-	2	-
Cist SE corner	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	4	-	-	15
Room 20, Level 2	-	-	-	-	-	1	-	-	-	-	-	1	1
Room 21, Surface 1	-	-	-	-	1	-	-	-	-	-	-	2	2
Room 22, Surface	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 2, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Subfloor Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Subfloor Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	5
Room 23, Test trench 36, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 1	-	-	-	-	-	-	-	-	-	1	-	3	-
Floor 1	-	-	-	-	-	-	-	-	-	1	-	1	-
Bin 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	-	-	-	-	-	2	-	-	7
Room 25, Level 1	-	-	-	-	1	-	-	-	-	-	-	2	2
Kiva D, Clearing above	-	-	-	-	1	-	1	1	-	-	-	7	-
Test trench 25, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	2	-	1	-	-	-	5	-
Level 9	-	-	-	-	-	-	-	-	-	-	-	2	-
Balk 1, microst. 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 1	-	-	-	-	3	1	-	-	-	-	-	8	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	2	-
Level 5	-	-	-	-	-	-	-	-	-	-	1	3	-
Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 7	-	-	-	-	1	-	-	-	-	1	-	2	-
Level 8	-	-	-	-	-	-	-	-	-	-	1	5	-
Level 9	-	-	-	-	-	1	-	-	-	-	-	2	-
Level 10	-	-	-	-	-	-	-	-	-	1	-	2	-
F. f. Level 11	-	-	-	-	-	-	-	-	-	-	-	4	-
Floor 1 contact	-	-	-	-	1	-	-	-	-	1	-	13	-
Firepit 1	-	-	-	-	-	-	-	-	-	-	-	4	-
Bin 1	-	-	-	-	-	-	-	-	-	1	-	1	-
Vent chinking	-	-	-	-	-	-	-	-	-	-	-	1	-
Pithouse A antechamber fill	-	-	-	-	-	1	1	1	-	1	-	8	-
Room total	-	-	-	-	6	5	2	3	-	5	2	-	74
Kiva E, Test trench 29	-	-	-	-	-	-	-	-	-	-	-	3	-
Test trench 37, Level 1	-	-	-	-	-	1	-	-	-	-	-	1	-
Layer 1	-	-	-	-	1	-	-	-	-	1	-	2	-
Layer 3A	-	-	-	-	2	1	-	-	-	-	-	5	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Layer 3B	-	-	-	-	2	-	-	-	-	-	-	2	-
Layer 4	1	-	-	-	1	-	-	-	-	-	1	3	-
Layer 5	-	-	-	-	1	-	-	-	-	-	-	2	-
Balk 1, Layer 5	1	-	-	-	1	-	-	-	-	-	-	3	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	1	-	4	-
Firepit 1	-	-	-	-	-	-	-	-	-	1	-	1	-
Southern recess	-	-	-	-	2	1	1	-	-	-	-	5	-
Room total	2	-	-	-	10	3	1	-	-	3	1	-	31
Kiva F, Test trench 34, Level 2	-	-	-	-	-	-	-	-	-	1	-	1	-
Level 5	-	-	-	-	1	1	1	-	-	-	-	5	-
Level 6	-	-	-	-	-	-	-	-	-	1	-	5	-
Level 7	-	-	-	-	-	-	-	-	-	1	-	1	-
Floor 1 contact	-	-	-	-	1	-	-	-	-	-	-	1	-
Subfloor vent	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	2	1	1	-	-	3	-	-	15
Kiva G, Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Levels 9 and 10	-	-	-	-	-	-	-	-	-	1	-	1	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	3	-
Vent tunnel	-	-	-	-	-	-	1	-	-	-	-	1	-
Room total	-	-	-	-	-	-	1	-	-	1	-	-	6
Plaza, General	-	-	-	-	1	1	-	-	-	4	3	17	-
Cist 10	-	-	-	-	-	-	-	-	-	-	-	1	-
Cist 12	-	-	-	-	-	-	-	-	-	-	-	1	-
East of Kiva D	-	-	-	-	-	2	1	-	-	-	-	6	-
Trench S of room 20	-	-	-	-	-	-	1	-	-	-	-	1	-
Room total	-	-	-	-	1	3	2	-	-	4	3	-	26
Ramada East of room 14, Fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 1	-	-	-	-	-	-	1	-	-	1	-	6	-
Level 2	-	-	-	-	1	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	-	1	-	-	1	-	-	8
Trash mound, Test trench 1, Level	-	-	1	-	2	1	-	-	-	1	-	8	-
Test trench 2, Level 1	-	-	-	-	2	-	1	-	-	2	-	15	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	2	-
Test trench 1 EL2, Level 2	-	-	-	-	-	-	-	-	-	1	-	1	-

Table 5.172. (continued)

	Grooved abraders				Polishing stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Level 3	-	-	-	-	-	1	-	-	-	-	-	1	-
FL2, Layer 1	1	-	-	-	-	1	-	-	-	1	-	2	-
GL2, Layer 1	-	-	-	-	-	1	-	-	-	-	-	2	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	1	-	-	-	-	-	1	-
HR1, Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	-
JL1, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
KL1, Level 3	-	-	-	-	-	-	1	-	-	-	-	3	-
Layer 2	-	-	-	-	1	2	-	-	-	-	-	3	-
KL2, Level 1	-	-	-	-	1	-	-	-	-	-	-	1	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
KX, Layer 1	-	-	-	-	1	-	-	-	-	1	-	2	-
Trash total	1	1	-	-	7	6	2	-	-	6	-	-	45
Totals	4	1	2	-	57	27	23	6	-	65	13	-	500

10s = Soft active abraders.
10h = Hard active abraders
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abrader.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.173. Primary context abraders by construction episode at 29SJ 627.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Construction Episode 1:																				
Storage Rooms:																				
Room 16, feature 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramada areas:																				
Room 5, Floor 2 assoc.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 7, Floor 2 assoc.	3	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	
Room 8, Floor 3 assoc.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 10, Floor 2 assoc.	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total number	4	1	1	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Total percentage	23.5	5.9	5.9	-	-	-	-	-	-	-	-	17.6	-	-	-	-	-	-	-	-
Episode 1 misc.																				
Room 10, Floor 2, Bin wall	-	-	-	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-
Pile in Rooms 14, 16, 19	1	9	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-
Combined total number	5	10	1	-	-	-	1	-	-	-	1	4	1	-	-	-	-	-	-	-
Combined total percentage	14.7	34.0	2.9	-	-	-	2.9	-	-	-	2.9	11.7	2.9	-	-	-	-	-	-	-
Construction Episode 2:																				
Storage Rooms:																				
Room 4, Floor 1 assoc.	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 19, Floor 1 assoc.	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ramada Areas:																				
Room 5, Floor 1 assoc.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 8, Floor 2 assoc.	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 10, Floor 1 Replas.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Habitation Structures:																				
Pithouse C, Floor 1 assoc.	3	5	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-
Pitstructure F, Floor 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total number	5	11	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-	-
Total Percentage	13.1	28.9	-	-	-	-	-	-	-	-	2.6	2.6	2.6	-	-	-	-	-	-	-
Construction Episode 3:																				
Storage Rooms:																				
Room 14, Floor 1 assoc.	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 16, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Habitation Rooms:																				
Room 5, Floor 1 assoc.	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-

Table 5.173. (continued)

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room 7, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room 14, Floor 1 assoc.	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 17-18, Floor 1 assoc.	1	-	-	-	-	-	-	-	-	-	-	1	2	1	-	-	-	-	-	-
Kivas:																				
Kiva D, Floor 1 assoc.	6	5	-	1	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
Kiva G, Floor 1 assoc.	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Kiva E, Floor 1 assoc.	-	1	-	1	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Total numbers	8	10	-	2	-	-	-	1	-	-	-	4	4	5	-	-	-	-	-	-
Total percentages	16.3	20.4	-	4.1	-	-	-	2.0	-	-	-	8.2	8.2	10.2	-	-	-	-	-	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.173. (continued)

	Grooved Abraders				Polishing Stones					Anvils		
Provenience	30	31	32	33	40	41	42	43	44	50	52	Total
Construction Episode 1:												
Storage Rooms:												
Room 16, feature 6	-	-	-	-	-	-	-	-	-	-	1	1
Ramada areas:												
Room 5, Floor 2 assoc.	-	-	-	-	1	-	2	-	-	1	-	5
Room 7, Floor 2 assoc.	-	-	-	-	1	-	-	-	-	-	1	8
Room 8, Floor 3 assoc.	-	-	-	-	-	-	-	-	-	-	-	1
Room 10, Floor 2 assoc.	-	-	-	-	1	-	-	-	-	-	-	2
Total number	-	-	-	-	3	-	2	-	-	1	2	17
Total percentage	-	-	-	-	17.6	-	11.8	-	-	5.9	11.8	-
Episode 1 misc.												
Room 10, Floor 2, Bin wall	-	-	-	-	-	-	-	-	-	-	-	2
Pile in Rooms 14, 16, 19	-	-	-	-	-	-	-	-	-	3	-	15
Combined total number	-	-	-	-	3	-	2	-	-	4	2	34
Combined total percentage	-	-	-	-	8.8	-	5.9	-	-	11.7	5.9	-
Construction Episode 2:												
Storage Rooms:												
Room 4, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	2
Room 19, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	1	-	3
Ramada Areas:												
Room 5, Floor 1 assoc.	-	-	-	-	1	-	2	-	-	1	-	5
Room 8, Floor 2 assoc.	-	-	-	-	-	1	-	-	-	1	1	6
Room 10, Floor 1 Replas.	-	-	-	-	-	-	-	-	-	1	-	1
Habitation Structures:												
Pithouse C, Floor 1 assoc.	-	-	1	-	2	-	1	-	-	4	1	20
Pitstructure F, Floor 1	-	-	-	-	1	-	-	-	-	-	-	1
Total number	-	-	1	-	4	1	2	-	-	8	2	38
Total percentage	-	-	2.6	-	10.5	2.6	7.8	-	-	21.0	5.3	-
Construction Episode 3:												
Storage Rooms:												
Room 14, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	2
Room 16, Floor 1 assoc.	-	-	-	-	-	-	1	-	-	1	-	3
Habitation Rooms:												
Room 5, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	5	-	7

Table 5.173. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils		
	30	31	32	33	40	41	42	43	44	50	52	Total
Room 7, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	1
Room 14, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	2
Room 17-18, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	3	-	8
Kivas:												
Kiva D, Floor 1 assoc.	-	-	-	-	1	-	-	-	-	2	-	18
Kiva G, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	3
Kiva E, Floor 1 assoc.	-	-	-	-	-	-	-	-	-	2	-	5
Total numbers	-	-	-	-	1	-	1	-	-	13	-	49
Total percentages	-	-	-	-	2.0	-	2.0	-	-	26.5	-	-

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Pithouse C. The floor and floor features had 20 abraders, reflecting a variety of activities. Unfortunately, many of these were probably post occupational. The complete floor abraders included four active abraders, one anvil, a polishing stone, a passive abrader-anvil, and an anvil-abrader. They were scattered in the structure and do not appear to represent work areas.

Pitstructure F. This was the other habitation structure for this time period. Unfortunately, it had been cleaned out at abandonment, with only one abrader left on the floor—a polisher.

In summary, Table 5.173 shows an increase in polishers from the earlier period, with fewer passive abraders, and more anvils. A large part of this difference may be due to the occurrence of habitation structures in the second roomblock construction episode which were not represented in the first episode. The sample size is quite low.

Roomblock Construction Episode 3. During this last major construction episode the site consisted of seven storage rooms, eleven habitation and work rooms, and two kivas. Again, the number of abraders from any one floor was small and not even the kivas had enough abraders to generalize about the change in function of pitstructures that accompanied the transition from pithouses to kivas. Half of the lapidary abraders listed in Table 5.173 were associated with kiva floors. This suggests that kiva floors were the focus of lapidary work.

In general, hard active abraders have largely replaced polishers; the ratio has changed from 2:1 to 1.3:1, and finally 5:1. Other than that, there is little change in the overall percentages of abrader types represented.

Although 29SJ 627 had a long complex occupation, there is no practical way to break it up by component to discuss general site trends other than what is done in Table 5.173. The artifact assemblage as a whole should be more representative of a Pueblo II site than any other time slot. The total percentage of active abraders increased and there was more diversity, which may be due in part to the large sample size. The number of passive abraders also increased but is still low compared to Pueblo Alto. Polishers definitely decreased.

Other Observations. A surprisingly large number of the abraders were complete, 75.6 percent of the sample. One would think that the longer the occupation, the more the heavily used and discarded objects would be represented. This is not the case, possibly because abraders were used in construction. Since there were few courses left in the standing wall stubs or wall-fall, this idea could not be tested. The excavator (M. Truell, personal communication 1979 and 1992) suggests that the wall rock was scavenged for building elsewhere in the rincon.

At 29SJ 627 we begin to see a decrease in the percentage of cobble materials, especially quartzite. This, along with data from 29SJ 629, suggests that by early Pueblo II times there was little use for these. They had been replaced by hard active abraders, and possibly little pottery was made at the site.

The number of artifacts with previous uses was quite high, 23.4 percent, most of which were manos (77.7 percent). This site had the lowest percentage of unmodified abraders in the sample, 45.5 percent, with most having only slight or moderate modification. Again, it is surprising that only 2.9 percent of the abrader use was rated as heavy. More than half of the abraders (53.1 percent) were reused. Almost all of the reuse was for hammerstones or choppers.

29SJ 628

Site 29SJ 628 is a Basketmaker III village located in Marcia's Rincon on the south side of the canyon and west of the Visitors Center. It was excavated in the summer of 1973 by Marcia Truell (1973). Six pithouses, six storage cists, and the plaza were excavated. The site dates roughly from A.D. 760 to 830.

One hundred and forty-two abraders were recovered and analyzed from this site. Of these, 104 or 73.2 percent were complete. The pithouse assemblages will be described from earliest to latest. Provenience information can be found in Table 5.174.

Pithouse C. This structure was filled with trash interfingered with lenses of sand and probably represents a short period of accumulation. The first three levels of fill in the main structure contained 23

Table 5.174. 29SJ 628 abraders.

		Active Abraders											Passive Abraders								
Provenience		10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Surface stripping		-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse A, Level 2		-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 4 floor feature	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Totals	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse C,	Level 1	-	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Level 2	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	1	3	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
	Floor 1 assoc.	1	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Antechamber,	Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-
	Floor 1 assoc.	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	3	9	-	-	-	1	-	-	-	-	1	4	3	-	-	-	-	-	-	-
Pithouse D,	Level 1	-	1	-	-	-	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Level 2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor 1 assoc.	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	-	2	-
	Pit 1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antechamber, Fill		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 4	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor 1 assoc.	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vent fill	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Room total	4	7	1	-	-	2	-	-	-	-	1	1	-	-	-	-	1	-	1	-
Pithouse E, Fill		-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 2	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 5	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
	Floor 1 assoc.	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
	Vent fill	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Room total	-	4	-	-	-	1	1	-	-	-	1	2	1	-	-	-	1	-	-	-
Pithouse F,	Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Room total	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-

Table 5.174 (continued)

Provenience		Active Abraders											Passive Abraders								
		10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Pithouse G,	Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Floor fill, Level 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Vent fill	-	2	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
	Room total	-	4	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	-
Cist 1	Floor 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cist 4	Fill	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals		7	28	1	-	-	4	1	-	-	-	3	10	5	-	-	-	3	-	1	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.174. (continued)

Provenience		Grooved Abraders 30	31	32	33	Polishing Stones 40	41	42	43	44	Anvils 50	52	Sub	Total
Surface stripping		-	-	-	-	-	-	-	-	-	-	-	1	1
Pithouse A, Level 2		-	-	-	-	2	-	-	-	-	-	-	3	-
	Level 3	1	-	-	-	-	-	-	-	-	-	-	1	-
	Level 4 floor features	-	-	-	-	4	1	-	-	-	-	-	5	-
	Floor 1 assoc.	-	-	-	-	1	1	-	-	-	-	-	2	-
	Totals	1	-	-	-	7	2	-	-	-	-	-	-	11
Pithouse C,	Level 1	-	-	-	-	-	-	-	1	-	-	-	4	-
	Level 2	-	-	-	-	2	1	-	-	-	-	-	6	-
	Level 3	-	-	-	-	3	1	1	-	-	2	-	13	-
	Floor 1 assoc.	-	-	-	-	1	1	-	-	-	1	-	6	-
Antechamber,	Level 1	-	-	-	-	-	-	-	-	-	1	-	1	-
	Level 2	-	-	-	-	1	-	-	-	-	1	-	3	-
	Level 3	-	-	-	-	3	-	-	-	-	2	-	8	-
	Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	2	-
	Room total	-	-	-	-	10	3	1	1	-	7	-	-	43
Pithouse D,	Level 1	-	-	-	-	2	1	-	-	-	-	-	6	-
	Level 2	-	-	-	-	-	-	-	-	-	2	-	5	-
	Floor 1 assoc.	-	-	-	-	1	-	-	-	-	-	-	5	-
	Pit 1	-	-	-	-	-	1	-	-	-	-	-	3	-
Antechamber, Fill		-	-	-	-	2	-	-	-	-	1	-	4	-
	Level 3	-	-	-	-	-	-	-	1	-	-	-	3	-
	Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-
	Floor 1 assoc.	-	-	-	-	1	-	-	-	-	1	-	3	-
	Vent fill	1	-	-	-	-	1	2	-	-	-	-	6	-
	Room total	1	-	-	-	6	3	2	1	-	4	-	-	36
Pithouse E, Fill		-	-	-	-	-	-	-	-	-	-	-	1	-
	Level 1	-	-	-	-	1	-	-	-	-	-	-	1	-
	Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
	Level 4	-	1	-	-	-	-	-	-	-	-	-	1	-
	Level 5	-	1	-	-	-	2	-	-	-	3	-	9	-
	Floor 1 assoc.	-	-	-	-	4	-	-	-	-	1	-	8	-
	Vent fill	1	2	-	-	2	1	-	-	-	1	1	10	-
	Room total	1	4	-	-	7	3	-	-	-	5	1	-	32

Table 5.174. (continued)

Provenience		Grooved Abraders				Polishing Stones					Anvils			
		30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Pithouse F,	Level 2	-	-	-	-	1	-	-	-	-	1	-	2	-
	Floor 1 assoc.	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	-	-	-	1	-	-	-	-	1	-	-	3
Pithouse G,	Level 1	-	-	-	-	1	-	-	-	-	-	1	3	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	2	-
	Floor fill, Level 4	-	-	-	-	1	-	-	-	-	-	-	1	-
	Vent fill	-	-	-	-	1	-	-	-	-	-	-	5	-
	Room total	-	-	-	-	3	-	-	-	-	-	1	-	11
Cist 1	Floor 2	-	-	-	-	1	1	1	-	-	-	-	3	3
Cist 4	Fill	-	-	-	-	-	-	-	-	-	-	-	2	2
Totals		3	4	-	-	35	12	4	2	-	17	2	-	142

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

abraders of all kinds and the antechamber had four more. Six abraders were associated with the first floor of the main chamber and two with the antechamber. Very little remained on the floor other than ground stone. The distribution did not suggest activity areas. All seem to represent household items that were not important enough to remove when the structure was abandoned.

Pithouse D. Trash and alluvium filled this pitstructure. There were two centrally located mounds of trash. The fill of the antechamber was mostly alluvial with a lense of trash. Eleven abraders were recovered from the fill of the main chamber, eight from the antechamber, and six from the vent fill. Floor contact artifacts were probably part of the trash deposited soon after abandonment.

Pithouse G. The upper fill layer of this structure contained an intrusive cist or baking pit which may account for the three abraders found in that level. Two abraders were found in the alluvial fill. The floor fill contained one abrader—a polisher. There were no floor contact abraders.

Pithouse E. This structure was filled with four distinct layers of trash. Fourteen abraders were removed from the fill, none were from the lowest fill layer. The ventilator contained 10 abraders. There were more items on this floor than from any other structure in the site. Behind the wing walls were an anvil, a mano, two sandstone slabs, and a red river cobble on one side; on the other side, a polisher, a red river cobble, and a mano made into a hoe were found. These may not suggest tool kits but could represent work or storage areas.

Pithouse A. Although this pithouse was trash-filled, only four abraders were found in the fill and five more in the floor fill. The excavator believed that the floor fill and floor contact materials were either in association with the floor or dumped in directly after abandonment. The only two floor abraders were polishers.

Pithouse F. Two abraders were found in this trash-filled structure. Built into the floor was a passive abrader. Again, there was little else on the floor to suggest work areas or abrader function.

Cist 1. The cist was located six meters west of Pithouse A and contained a small subfloor cist at the southern end. The smaller cist contained an interesting array of three abraders on its second floor: an undifferentiated polisher, a pot polisher, and a floor polisher. Additionally, there was a Lino Gray seed jar filled with a yellowish clay and a bone awl. This is a rare association of clay and polisher. In general, the abrader attributes from site 29SJ 628 conform to the Pueblo I pattern already specified. All aspects are similar to the other sites of this time period.

Site 29SJ 629

Site 29SJ 629 is a small house site located in Marcia's Rincon west of the Visitors Center. It was excavated during the summers of 1975 and 1976 under the direction of Thomas C. Windes (Windes 1993). The site excavation included nine surface rooms, two pithouses, a kiva, and intervening plazas. The site dates roughly from A.D. 875 to 1050 (Windes 1978b, 1993).

Two hundred and forty-eight abraders were analyzed from this site; of this number 177 were complete (71.4 percent). Table 5.175 gives the proveniences for the abraders.

Pithouse 2. In Layers 5 and 6 and on Floor 1 there was definite evidence of lapidary activity. Quantities of minute turquoise chips, turquoise beads broken in manufacture, lithics, and a micro-drill were found. The abrader assemblage included two active lapidary abraders, one undifferentiated passive abrader, one passive lapidary abrader, one incidental palette, a polisher, and a floor polisher. The passive abrader, passive lapidary abrader, and active lapidary abraders cluster spatially and imply a lapidary tool kit. Layer 4, described as a structural rubble layer with much ground stone and roofing adobe, also contained one active and two passive lapidary abraders, as well as an undifferentiated passive abrader and a passive abrader-anvil. These were quite likely associated with the lapidary activity and may have been cached in the roof beams. No abraders were found on the lower floors of this structure.

Pithouse 3. Layers 2 and 3 of this structure contained numerous abraders, including eleven passive lapidary abraders. Turquoise fragments were found among the debris. Floor contact abraders included one active and one passive lapidary abrader, either or both of which could have been refuse dumped into the room.

Table 5.175. 29SJ 629 abraders.

Provenience		Active Abraders											Passive Abraders								
		10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
General surface, Grid 23		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 26,	Levels 1 - 4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Grids 45-54,	Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse 2,	Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
	Layer 4	-	-	-	1	-	-	-	-	-	-	-	1	1	2	-	-	-	-	-	-
	Layer 5	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Layer 6, fl. fill	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	1	-
	Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-
	Mealing bin 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mealing bin 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Construction	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Ventilator fill	1	-	-	-	-	-	-	-	-	-	-	1	1	2	-	-	-	-	-	-
	Room total	2	1	-	3	-	-	-	-	-	-	-	5	3	7	-	-	-	-	1	-
Pithouse 3,	Levels 3-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 5	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Level 7	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Level 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 9	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
	Layer 1	1	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
	Layer 2	1	2	-	-	-	-	-	-	-	-	-	1	-	5	-	-	-	-	-	-
	Layers 2 and 3	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-
	Layer 3	-	2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
	Floor fill	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Floor contact	-	1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
	Wall niche 2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Firepit 1 const.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Vent construction	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Vent fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-
	Room total	5	7	-	-	-	-	-	-	-	-	-	8	-	13	-	-	-	1	2	-
Room 1,	Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Room 2,	On wall top	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Layer 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Firepit 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-
Room 3,	Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5.175. *(continued)*

		Active Abraders											Passive Abraders								
Provenience		10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
	Level 4, fl. fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
	Pit 2 fill	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	1	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Room 5,	Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
	Fl. 1, Posthole 2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Bench top	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
	Room total	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-
Room 6,	Layer 2	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
	Floor 1, contact	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
	Room total	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	-
Room 7,	Tub room, fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	East wall	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Room total	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 8,	Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 9,	Level 1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Floor 1, contact	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Feature 3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Firepit base	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Fl. 2, p.h. 2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Room total	-	-	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-	-	-
Kiva 1,	Level 8	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 11, fl. fill	-	-	-	-	-	-	-	-	-	-	-	1	-	2	-	-	-	-	-	-
	Layer 10	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Floor 1 contact	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-
	embedded in fl.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	firepit fill	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
	Vent. construction	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
	Room total	-	1	-	1	-	-	-	-	-	-	2	2	2	4	-	-	-	-	-	-
Plaza grid 8,	Wall construction	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Plaza grid 9,	Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
	Other pit 1	-	-	1	-	-	-	-	-	-	-	-	2	-	34	-	-	-	-	-	-
Plaza grid 14,	Level 1	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Firepit 2 const.	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
	Other pit 6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Other pit 14	3	7	-	1	-	-	-	1	-	-	-	2	1	1	-	-	-	-	-	-

Table 5.175. (continued)

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Grid total	6	7	-	1	-	-	-	1	-	-	-	2	3	1	-	-	-	-	-	-
Plaza grid 15, Layer 1	-	-	-	-	-	-	-	-	-	-	1	-	-	4	-	-	-	-	-	-
Plaza grid 16, Level 1	-	-	-	-	-	-	-	-	-	-	1	-	-	2	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	-
Other pit 15	-	-	-	-	-	-	-	1	-	-	-	2	-	4	-	-	-	-	-	-
Grid total	-	-	-	-	-	-	-	1	-	-	1	3	-	7	-	-	-	-	-	-
Plaza grid 21, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza grid 22, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Posthole 25	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza grid 35, Surface 1	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza association	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Trash grids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 64, Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 65, Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 70, Level 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 71, Level 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 76, Surface	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 82, Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grid 88, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trash total	4	1	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Back dirt	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Totals	19	21	1	5	-	1	-	2	-	-	8	31	9	83	-	-	1	-	4	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.

19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.175. (continued)

Provenience		Grooved Abraders				Polishing Stones					Anvils			
		30	31	32	33	40	41	42	43	44	50	52	Sub	Total
General surface, Grid 23		-	-	-	-	-	1	-	-	-	-	-	1	1
Grid 26,	Levels 1 - 4	-	-	-	-	-	-	-	-	-	-	-	1	1
Grids 45-54,	Level 2	-	-	-	-	-	-	-	-	-	-	1	1	1
Pithouse 2,	Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-
	Layer 4	-	-	-	-	-	-	-	-	-	-	-	5	-
	Layer 5	-	-	-	-	-	-	-	-	-	-	-	2	-
	Layer 6, fl. fill	-	-	-	-	1	-	-	-	-	-	-	5	-
	Floor 1 contact	-	-	-	-	-	-	1	-	-	-	-	3	-
	Mealing bin 1	-	-	-	-	-	-	-	-	-	-	-	1	-
	Mealing bin 2	-	-	-	-	-	-	-	-	-	1	-	1	-
	Construction	-	-	-	-	-	-	-	-	-	1	-	2	-
	Ventilator fill	-	-	-	-	-	-	-	-	-	1	-	6	-
	Room total	-	-	-	-	1	-	1	-	-	3	-	-	27
Pithouse 3,	Levels 3-6	-	-	-	-	1	-	-	1	-	1	-	3	-
	Level 3	-	-	-	-	-	-	-	-	-	1	-	1	-
	Level 5	-	-	-	-	-	-	-	-	-	-	-	1	-
	Level 7	-	-	-	-	-	-	-	-	-	-	-	2	-
	Level 8	-	-	-	-	1	-	-	-	-	-	-	2	-
	Level 9	-	-	-	-	-	1	-	-	-	2	-	6	-
	Layer 1	-	-	-	-	-	-	-	-	-	-	-	3	-
	Layer 2	-	-	-	-	1	-	-	-	-	-	-	10	-
	Layers 2 and 3	-	-	-	-	-	-	-	-	-	-	-	4	-
	Layer 3	-	-	-	-	3	-	-	-	-	-	-	7	-
	Floor fill	-	-	-	-	-	-	-	-	-	-	-	2	-
	Floor contact	-	-	-	-	-	-	-	-	-	-	-	3	-
	Wall niche 2	-	-	-	-	-	-	-	-	-	-	-	1	-
	Firepit 1 const.	-	-	-	-	-	-	-	-	-	-	-	1	-
	Vent construction	-	-	-	-	-	-	-	-	-	-	-	1	-
	Vent fill	-	-	-	-	1	-	-	-	-	-	-	2	-
	Room total	-	-	-	-	7	1	-	1	-	4	-	-	49
Room 1,	Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 2,	On wall top	-	-	-	-	-	-	-	-	-	-	-	1	-
	Layer 1	-	-	-	-	-	-	1	-	-	2	-	4	-
	Layer 2	-	-	-	-	3	-	-	-	-	-	-	4	-
	Firepit 1	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	-	-	-	3	-	1	-	-	2	-	-	10
Room 3,	Layer 1	-	-	1	-	-	-	-	-	-	-	-	1	-

Table 5.175. (continued)

Provenience		Grooved Abraders				Polishing Stones					Anvils			
		30	31	32	33	40	41	42	43	44	50	52	Sub	Total
	Level 4, fl. fill	-	-	-	-	1	-	-	-	-	-	-	1	-
	Floor 1 contact	-	-	-	-	-	-	-	-	-	-	-	2	-
	Pit 2 fill	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	-	1	-	1	-	-	-	-	-	-	-	5
Room 5,	Level 3	-	-	-	-	-	-	-	-	-	-	-	2	-
	Fl. 1, Posthole 2	-	-	-	-	-	-	-	-	-	-	-	1	-
	Bench top	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	-	-	-	-	-	-	-	-	-	-	-	4
Room 6,	Layer 2	-	-	-	-	-	-	-	-	-	-	-	2	-
	Floor 1, contact	-	-	-	-	-	-	-	-	-	-	-	3	-
	Room total	-	-	-	-	-	-	-	-	-	-	-	-	5
Room 7,	Tub room, fill	-	-	-	-	-	-	-	-	-	1	-	1	-
	East wall	-	-	-	-	-	-	1	-	-	-	-	1	-
	Room total	-	-	-	-	-	-	1	-	-	1	-	-	2
Room 8,	Layer 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 9,	Level 1	-	-	-	-	1	-	-	-	-	-	-	2	-
	Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
	Floor 1, contact	-	-	-	-	-	-	-	-	-	1	-	1	-
	Feature 3	-	-	-	-	-	-	-	-	-	1	-	2	-
	Firepit base	-	-	-	-	-	-	-	-	-	1	-	1	-
	Fl. 2, p.h. 2	-	-	-	-	-	-	-	-	-	-	-	1	-
	Room total	-	-	-	-	1	-	-	-	-	3	1	-	8
Kiva 1,	Level 8	-	-	-	-	-	-	-	1	-	-	-	2	-
	Level 11, fl. fill	-	-	-	-	-	-	-	-	-	2	-	5	-
	Layer 10	-	-	-	-	-	-	-	-	-	-	-	1	-
	Floor 1 contact	-	-	-	-	1	-	-	-	-	-	-	4	-
	embedded in fl.	-	-	-	-	-	-	-	-	-	-	-	1	-
	firepit fill	-	-	-	-	-	-	-	-	-	-	-	1	-
	Vent. construction	-	-	-	-	-	-	-	-	-	-	-	2	-
	Room total	-	-	-	-	1	-	-	1	-	2	-	-	16
Plaza grid 8,	Wall construction	-	-	-	-	-	-	-	-	-	-	-	1	1
	Level 2	-	-	-	-	-	-	-	-	-	1	-	3	3
Plaza grid 9,	Layer 4	-	-	-	-	-	-	-	-	-	-	-	1	1
	Other pit 1	-	-	-	-	-	-	-	-	-	1	-	38	38
Plaza grid 14,	Level 1	-	-	-	-	-	-	-	-	-	-	-	3	-
	Firepit 2 const.	-	-	-	-	-	-	-	-	-	-	-	1	-
	Other pit 6	-	-	-	-	-	-	-	-	-	-	-	1	-
	Other pit 14	-	-	-	-	3	1	-	-	-	3	1	24	-

Table 5.175. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Grid total	-	-	-	-	3	1	-	-	-	3	1	-	29
Plaza grid 15, Layer 1	-	-	-	-	1	-	-	-	-	-	-	6	6
Plaza grid 16, Level 1	-	-	-	-	-	-	-	-	-	1	-	4	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	2	-
Other pit 15	-	-	-	-	-	-	-	-	-	1	-	8	-
Grid total	-	-	-	-	-	-	-	-	-	2	-	-	14
Plaza grid 21, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Plaza grid 22, Level 1	-	-	-	-	-	-	-	-	-	1	-	1	1
Posthole 25	-	-	-	-	-	-	-	-	-	-	-	1	1
Plaza grid 35, Surface 1	-	-	-	-	-	1	-	-	-	1	-	4	4
Plaza association	-	-	-	-	-	-	-	-	-	-	-	1	1
Trash grids													
Grid 64, Level 3	-	-	-	-	1	-	-	-	-	-	-	1	-
Grid 65, Level 2	-	-	-	-	2	-	-	-	-	-	-	2	-
Level 4	1	-	-	-	2	-	-	-	-	-	-	3	-
Grid 70, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid 71, Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Grid 76, Surface	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	1	-	-	-	-	-	1	2	-
Grid 82, Level 2	1	-	-	-	-	-	-	-	-	-	-	1	-
Grid 88, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	1	-
Trash total	2	-	-	-	6	-	-	-	-	-	1	-	16
Back dirt	-	-	-	-	-	-	-	-	-	-	-	1	1
Totals	2	-	1	-	24	4	3	2	-	24	3	-	248

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Room 2. Layer 2 of this room contained one active abrader and three polishers. Two anvils and another polisher were recovered but could not be located for analysis. There were turquoise fragments from this layer, but none of the abraders substantiate lapidary activities.

Room 3. Two passive lapidary abraders were found on the floor and three fragments of turquoise were found in the floor fill. This is scant evidence, but the room could have been either a dump or possibly another area of lapidary activity.

Room 5. There was an interesting group of artifacts in this room. Floor contact materials included a passive lapidary abrader and a Glycymeris ring fragment. The fill included turquoise, micro-drills, ground calcite, and two more passive lapidary abraders. Again, this could represent a lapidary activity area but was more likely a dump.

Room 6. Five passive lapidary abraders were recovered from this room, two from the fill, and three from the floor. Although cultural material from this room was scarce, there was a possible micro-drill and a turquoise chip.

Kiva 1. The floor fill and floor contact abraders from the kiva included one abrader-anvil, a passive abrader, four passive lapidary abraders, one polisher, and two anvils. There was also a passive abrader-anvil imbedded in the floor. The abrader array suggests that lapidary activity took place in the kiva, but only one chip of turquoise was found on the floor. Several large bell-shaped pits found in the plaza had interesting abraders in their fill.

Other Pit 1. Located in the Plaza Grid 9, Other Pit 1 contained 34 passive lapidary and other kinds of abraders (Table 5.175). The quantities of turquoise in the pit were quite likely associated with the lapidary abraders.

Other Pit 14. Another large pit located in Plaza Grid 14 had a large and diverse array of abraders, including one active lapidary and one passive lapidary abrader along with seven turquoise chips. The 22 other abraders and a wide variety of other materials in the pit suggest a trash dump of a less specialized nature than Other Pit 1.

Other Pit 15. This pit, located in Plaza Grid 6, contained four passive lapidary abraders and four other abraders. The only other materials recovered from the pit were sherds. Windes (1993) notes that the passive abraders may have been for turquoise working, but there is no debris to confirm this.

Other Observations. The abrader assemblage from 29SJ 629 was unusual. Lapidary activity was an industry there. The site contained 20.0 percent of the active lapidary abraders and 70.3 percent of the passive lapidary abraders in this sample, or 11.2 percent of the entire abrader population. The passive lapidary abraders make up 33.5 percent of the site's assemblage. (See the individual abrader type descriptions for associations of lapidary abraders with turquoise from all sites).

Most of the proveniences were clearly dumps. The last occupation of Pithouse 2 and possibly Rooms 3, 5, and 6 may have been the only areas in which the lapidary activity took place. The areas would have been periodically cleaned up and dumped in diverse locations. This may account for a relatively short occupation of the site.

29SJ 629 is similar to the 29SJ 423 and 29SJ 724 in having low percentages of undifferentiated abraders, but the ratio of active abraders to polishers is not that different from the other Pueblo II sites. It is likely that the site is in the transition stages from the early polisher dominated assemblages to the later active abrader dominant assemblages.

The most interesting aspect of Table 5.176 is that by placing the sites in rank order we have duplicated the chronoloical sequence. Polishers are replaced by hard active abraders over time.

Table 5.176. Selected hard active abrader to polisher ratios.

Site Number	Actual Numbers	Ratio
29SJ 423	3 : 24	1 : 8
29SJ 299	16 : 42	1 : 2.6
29SJ 628	28 : 51	1 : 1.8
29SJ 1360	15 : 27	1 : 1.8
29SJ 629	21 : 31	1 : 1.5
29SJ 627	119 : 107	1.1 : 1
29SJ 389	271 : 19	14.3 : 1
29SJ 633	58 : 3	19.0 : 1

Although 29SJ 629 abounds in information on lapidary activity, it does not have good habitation areas with the abraders left in place. Rather than negating its use for habitation, the abraders suggest that, during its occupation, there was a period when intensive lapidary activity took place.

29SJ 633

29SJ 633 is also located in Marcia's Rincon west of the Visitors Center, on a low ridge that marks the northern periphery of the rincon. The site consists of approximately 15 rooms and at least three kivas. Only one-and-one-half rooms were excavated and several tests were made. Excavation was carried out during the summer of 1978 by Marcia Truell and Lou Ann Jacobson (Truell 1979; Mathien 1991). The excavated portions of the site date to late Pueblo III times around A.D. 1230.

Table 5.177 gives the provenience information for the abraders; one hundred and thirty-one were collected and analyzed from this site. Of these, 102 or 77.2 percent of the sample came from the one completely excavated room. One hundred and twenty-two, or 93.1 percent, of the abraders were complete. This is, by far, the largest percentage of complete abraders found in a site. It is followed by site 29SJ 299 with 86 percent, but that site had a large number of abraders left in situ where they would be expected to be complete. This was not the case for 29SJ 633.

Room 7. Eighty-five of the abraders from this room were found in the fill. The fill was trash with some structural rubble and probably represents discards from other portions of the site. The upper floor of the room had few of the features associated with a habitation room and only a heating pit rather than a firepit. Abraders from that floor included three hard active abraders and an anvil. Neither these, nor anything else from the floor, suggest room or artifactual functions.

Below the first floor was a second partial floor with features reminiscent of a habitation room. The one abrader found on this floor was an anvil.

Room 8. The eastern portion of this room was excavated. It had considerably fewer abraders, only 14, and none were from primary context. Again, the most common abrader was the hard active abrader but there was nothing to suggest its function.

Other Observations. In terms of individual abraders and assemblages, there was no primary association information to be gained; however, when the entire abrader population is compared to the other sites there are some unusual features. Since this is the only late Pueblo III site represented in our sample, the trends suggested here cannot be confirmed.

29SJ 633 had, by far, the largest percentage of hard and soft active abraders. It is closely followed by Una Vida and Pueblo Alto, the next latest in time. Although many of these abraders were found in fill proveniences and could represent wall-fall, 29SJ 633, like Pueblo Alto, also had a very low percentage of polishers, which indicates a time-related phenomenon rather than merely a characteristic of wall-fall.

29SJ 633 had the highest percentage of other-shaped abraders found in any site, 70.3 percent, followed by Pueblo Alto with 55.2 percent. Reuse was not unusual but secondary use was. Most of the wear recorded on the abraders was light, 72.5 percent, and none were heavily used. Perhaps the combination of whole abraders and little use suggest a caching of abrading tools in Room 7.

29SJ 633 had the highest percentage of unmodified tools in the sample at 84.0 percent, followed by 29SJ 423 with 82.1 percent. Considering that the other low percentages of modified abraders are from sites with assemblages heavily dominated by polishers, this is more dramatic. Very few of the abraders were extensively modified, only 0.8 percent. Little effort was put into abraders at this site, and none were significantly used. This undoubtedly says something about this late Mesa Verde occupation in the canyon; perhaps that it was more transient than those who lived there before.

29SJ 721

29SJ 721 is an early Pueblo I site located on a small knoll east of the mouth of Werito's Rincon. The structures include two pithouses, an unfinished Pueblo III kiva, seven cists and baking pits, and an isolated slab-lined storage room. It was excavated in

Table 5.177. 29SJ 633 abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Anomaly test 1, Layer 1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 2	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Layer 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Anomaly test 2, Layer 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anomaly test 8, Layer 2	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anomaly test 10, Layer 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 7, Layer 1	1	4	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Layer 2	4	16	-	1	-	-	-	1	1	-	1	1	3	-	-	-	-	-	-	-
Layer 3	4	8	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-
Layer 4	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Layer 5	4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layers 5 and 6	5	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 6, Level 7	2	2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-
Rock concent. 1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rock concent. 2	1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 contact	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 2 Other pit 2	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Bin 1, construct.	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Subfloor layer 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	22	44	1	1	-	-	-	1	1	-	2	3	6	1	-	-	-	-	2	-
Room 8, Surface	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Layer 1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Burial 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Level 7	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Level 8	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	8	-	-	-	-	-	-	-	-	-	1	1	1	-	-	-	-	-	-
Plaza test 1, Fill	-	2	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Test trench 3, Level 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals	24	58	1	1	-	-	-	1	1	-	4	5	7	2	-	-	-	-	2	-

Table 5.177. (continued)

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.177. (continued)

	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Anomaly test 1, Layer 1	-	-	-	-	-	-	-	-	-	-	-	2	-
Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 3	-	-	-	-	-	-	-	-	-	1	-	1	-
Total	-	-	-	-	-	-	-	-	-	1	-	-	4
Anomaly test 2, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 5	-	-	-	-	-	-	-	-	-	1	-	1	-
Total	-	-	-	-	-	-	-	-	-	1	-	-	2
Anomaly test 8, Layer 2	-	-	-	-	-	-	-	-	-	-	-	2	2
Anomaly test 10, Layer 1	-	-	-	-	-	-	-	-	-	1	-	1	1
Room 7, Layer 1	-	-	-	-	-	-	-	-	-	-	-	6	-
Layer 2	1	-	-	-	1	-	-	-	-	1	-	31	-
Layer 3	-	-	-	-	-	-	-	-	-	2	-	17	-
Layer 4	-	-	-	-	-	-	-	-	-	-	1	4	-
Layer 5	-	-	-	-	-	-	-	-	-	1	-	8	-
Layers 5 and 6	1	-	-	-	-	-	-	-	-	3	-	11	-
Layer 6, Level 7	-	-	-	-	-	-	-	-	-	3	-	9	-
Rock concent. 1	-	-	-	-	-	-	-	-	-	-	-	3	-
Rock concent. 2	-	-	-	-	-	-	-	-	-	1	1	5	-
Floor 1 contact	-	-	-	-	-	-	-	-	-	1	-	4	-
Floor 2 Other pit 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Bin 1, construct.	-	-	-	-	-	-	-	-	-	1	-	2	-
Subfloor layer 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	2	-	-	-	1	-	-	-	-	13	2	-	102
Room 8, Surface	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 1	-	-	-	-	-	-	-	-	-	-	-	1	-
Layer 1	-	-	-	-	1	-	-	-	-	-	-	2	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	4	-
Burial 2	-	-	-	-	-	-	-	-	-	-	1	1	-
Level 6	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 7	-	-	-	-	-	-	-	-	-	1	-	4	-
Level 8	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	-	-	-	-	1	1	-	15
Plaza test 1, Fill	-	-	-	-	-	-	-	-	-	-	-	4	4
Test trench 3, Level 1	-	-	-	-	1	-	-	-	-	-	-	1	1
Totals	2	-	-	-	3	-	-	-	-	17	3	-	131

Table 5.177. (continued)

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

the summer of 1973 under the direction of Thomas C. Windes (1976a). Table 5.178 locates the abraders within the site.

Four abraders, three of which were complete, were found at this site. Of these, an anvil came from the floor of Pithouse A. Windes (1976a:8) noted that little was left on the floor and "the inhabitants evidently removed everything of value." This might say something about the value of an anvil.

With such a low number of abraders, the only possible statement that can be made about the assemblage is that it is unusual to have such a large number of anvils, three, or 75 percent of the sample. Perhaps because anvils are rather large and easily replaced, they were left behind.

29SJ 724

29SJ 724 is another small, early Pueblo I site located on a ridge east of the mouth of Werito's Rincon. Nine rooms, a pithouse, and the intervening ramada and plaza areas were excavated by Thomas C. Windes in the summer of 1974 (Windes 1976b).

Only 23 abraders were recovered from this site; 60.9 percent were complete. Table 5.179 gives the provenience information for the abraders.

Pithouse A. The pitstructure contained seven abraders, almost a third of the total from the site. Two were on the floor. Again, Windes (1976b) thought that the tools of value had been removed at abandonment, and once again an anvil was left behind. The floor contact anvil was found within the wingwall area close to two metate fragments. The passive abrader-anvil lay near a group of five bone tinklers with other bone artifacts nearby. It is possible that this stone was used for some activity involving the bone tools and which needed a work surface. Another possibility is that the slab partially covered a pit described as conical shaped and over twice as deep as any other pit in the structure; perhaps a resonating chamber was formed by covering the pit with the slab and plunking it with the tinklers.

Room 9. This was the only room to have abraders associated with the floor. Two anvils were found. The room may have served as a work area or loci for domestic activities, as suggested by an anvil lying near the firepit. Anvils are common in floor contexts and are often close to the hearth.

Other Observations. Although the sample size is quite small, the 29SJ 724 abraders conform to the early pattern of abrader distributions. The percentage of active abraders is low and that of polishers high. Thirty-four percent of the total were burned. Cobble materials were all quartzite, but only eight were found.

The number and percentage of the abraders with a previous form is low, as in other early sites. A large number of the abraders was unmodified; 61.9 percent of those that were modified had only light or moderate manufacture. The amount of use was light 52.2 percent of the time, the highest found. This could be a sampling error. When few artifacts are found at a site, each possible artifact is closely scrutinized by the excavators and those with light wear are more likely to be collected. The duration of the occupation was also fairly short and may add to this. In general, this Pueblo I site does not represent any deviation from the Basketmaker III pattern.

29SJ 1360

Site 29SJ 1360 is located on a ridge between the base of Mesa Fajada and the canyon bottomlands. It consists of around fifteen rooms and five pitstructures. Eleven rooms, two pitstructures, the intervening plaza area, and a Pueblo I trash area were excavated by Randy Morrison in 1974. Peter J. McKenna returned to the site to further test some of the excavated rooms in 1979 (McKenna 1981, 1984). The site dates primarily to Pueblo II, roughly from A.D. 850 to 1020.

Eighty-six abraders were analyzed from the site, 75 or 84.3 percent were complete. Table 5.180 gives the distribution of these abraders in the site. Very few proveniences had enough abraders or other materials to provide functional information, plus very few were plotted on maps. Numerous unspecified ground stones or "slabs" were discarded in the field and others that should have been analyzed as abraders were included in the "other-shaped stone" analysis. There is no way of assessing the numbers or kinds of abraders affected.

Kiva A. This pitstructure had a good sample of abraders. These were the result of trash fill and none represent primary contexts.

Table 5.178. 29SJ 721 abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Room 1 area, Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse A, Floor 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse C, Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Room 1 area, Surface	-	-	-	-	-	-	-	-	-	1	-	1	1
Pithouse A, Floor 1	-	-	-	-	-	-	-	-	-	1	-	1	1
Pithouse C, Fill	-	-	-	-	1	-	-	-	-	1	-	2	2
Totals	-	-	-	-	1	-	-	-	-	3	-	-	4

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.179. 29SJ 724 abraders.

Provenience	Active Abraders											Passive Abraders								
	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Between room block and Pithouse A, Surface	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
In front of room 4, Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Test trench 1, Surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pithouse A, Layer 8, floor fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Vent fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room 3, Level 2	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Room total	-	1	-	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-
Room 5, Fill	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room 9, Fill	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Floor 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Trash area, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Totals	2	2	-	-	-	-	-	-	-	-	-	4	2	-	-	-	-	-	-	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.179. (continued)

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Between room block and Pithouse A, Surface	-	-	-	-	2	-	-	1	-	-	-	4	4
In front of room 4, Surface	-	-	-	-	1	-	-	-	-	-	-	1	1
Test trench 1, Surface	-	-	-	-	-	1	-	-	-	-	-	1	-
Level 1	-	-	-	-	-	-	-	-	-	-	-	1	2
Pithouse A, Layer 8, floor fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Floor 1	-	-	-	-	-	-	-	-	-	1	-	2	-
Vent fill	-	-	-	-	-	3	-	-	-	1	-	4	-
Room total	-	-	-	-	-	3	-	-	-	2	-	-	7
Room 3, Level 2	-	-	-	-	-	-	-	-	-	-	-	1	-
Level 3	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	-	-	-	-	-	-	-	-	3
Room 5, Fill	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 9, Fill	-	-	-	-	-	-	-	-	-	1	-	2	-
Floor 1	-	-	-	-	-	-	-	-	-	2	-	2	-
Room total	-	-	-	-	-	-	-	-	-	3	-	-	4
Trash area, Layer 2	-	-	-	-	-	-	-	-	-	-	-	1	1
Totals	-	-	-	-	3	4	-	1	-	5	-	-	23

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.180. 29SJ 1360 abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
House 1, Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 1, Floor	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Room 4, Fill	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 9, Fill	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room 11, Fill	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kiva A, Fill	2	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Level 1	2	2	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 3	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-
Level 4	-	1	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-
Room total	2	5	2	-	-	1	-	3	-	-	-	-	1	-	-	-	-	-	-	-
Kiva B, Fill	-	1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor 1 assoc.	-	3	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Bench contact	3	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Wall construction	-	-	-	-	-	-	1	-	-	-	-	1	-	1	-	-	-	-	-	-
Room total	3	4	2	1	-	-	1	-	-	-	-	1	-	4	-	-	-	-	-	-
Plaza Area I, fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Surface 3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	1	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Plaza Area III, fill	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Surface 2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Room total	1	1	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-
Plaza, Area IV, surface 1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trash midden	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Back dirt	-	3	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-
Totals	13	15	4	1	-	1	1	3	-	-	1	2	4	4	-	-	-	-	-	-

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abraded-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.

Table 5.180. *(continued)*

Provenience	Grooved Abraders				Polishing Stones					Anvils			
	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
House 1, Fill	-	-	-	-	1	-	-	-	-	-	-	1	1
Room 1, Floor	-	-	-	-	1	-	-	-	-	-	-	2	2
Room 4, Fill	-	-	-	-	-	-	-	-	-	-	-	1	1
Room 9, Fill	-	-	-	-	-	-	-	-	-	1	-	3	3
Room 11, Fill	-	-	-	-	1	-	-	-	-	-	-	2	2
Kiva A, Fill	-	-	-	-	2	-	-	-	-	-	-	8	-
Level 1	1	-	-	-	3	-	1	-	-	1	-	12	-
Level 2	-	-	-	-	3	2	-	-	-	-	1	6	-
Level 3	-	-	-	-	1	-	-	-	-	-	-	3	-
Level 4	-	-	-	-	-	-	-	-	-	-	-	2	-
Room total	-	-	-	-	6	2	-	-	-	1	1	-	31
Kiva B, Fill	-	-	-	-	-	-	-	-	-	1	-	5	-
Level 4	-	-	-	-	-	-	-	-	-	1	-	1	-
Floor 1 assoc.	-	-	-	-	-	-	-	-	-	1	-	6	-
Bench contact	-	-	-	-	3	2	1	-	-	-	-	10	-
Wall construction	-	-	-	-	-	-	-	-	-	-	-	3	-
Room total	-	-	-	-	3	2	1	-	-	3	-	-	25
Plaza Area I, fill	-	-	-	-	1	-	1	1	-	-	-	4	-
Surface 2	-	-	-	-	-	-	-	-	-	-	1	3	-
Surface 3	-	-	-	-	-	-	-	-	-	-	-	1	-
Room total	-	-	-	-	1	-	1	1	-	-	1	-	8
Plaza Area III, fill	-	-	-	-	-	-	-	-	-	-	-	1	-
Surface 2	-	-	-	-	1	-	-	-	-	3	-	6	-
Room total	-	-	-	-	1	-	-	-	-	3	-	-	7
Plaza, Area IV, surface 1	-	-	-	-	-	-	-	-	-	-	-	1	1
Trash midden	1	-	-	-	-	1	-	-	-	-	-	2	2
Back dirt	-	-	-	-	1	1	-	-	-	-	-	6	6
Totals	2	-	-	-	18	6	3	1	-	8	2	-	89

30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Table 5.181. 29SJ 1659 abraders.

	Active Abraders											Passive Abraders								
Provenience	10s	10h	11	12	13	14	15	16	17	18	19	20	21	22	24	25	26	27	28	29
Pithouse Y, Fill	-	4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Antechamber	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Floor	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cist 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Room total	-	4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Cist 2, Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Totals	-	4	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-

	Grooved Abraders				Polishing Stones					Anvils			
Provenience	30	31	32	33	40	41	42	43	44	50	52	Sub	Total
Pithouse Y, Fill	-	-	-	-	-	-	1	-	-	4	-	10	-
Antechamber	1	-	-	-	1	2	-	-	-	-	-	4	-
Floor	-	-	-	-	1	-	-	-	-	-	-	1	-
Cist 1	-	-	-	-	1	2	-	-	-	-	-	3	-
Room total	1	-	-	-	3	4	1	-	-	4	-	-	18
Cist 2, Fill	-	-	-	-	1	-	-	-	-	-	-	1	1
Totals	1	-	-	-	4	4	1	-	-	4	-	-	19

10s = Soft active abraders.
10h = Hard active abraders.
11 = Faceted active abraders.
12 = Active lapidary abraders.
13 = Manolike abraders.
14 = Stones abraded for pigment.
15 = Paint grinders.
16 = Edge abraders.
17 = Cornbreaker abraders.
18 = An unusual abrader rock.
19 = Abrader-anvils.
20 = Passive abraders.
21 = Passive abrader-anvil combinations.
22 = Passive lapidary abraders.
24 = Mortars.
25 = Pecked-hole abraders.
26 = Undifferentiated palettes.
27 = Raised bordered palettes.
28 = Incidental palettes.
29 = Paint mortars.
30 = Undifferentiated grooved abraders.
31 = Shaft shapers.
32 = Decorative grooved rocks.
33 = Point sharpeners.
40 = Undifferentiated polishers.
41 = Probable pot polishers.
42 = Large polishers.
43 = Broken edge polishers.
44 = "Lightning Stones."
50 = Undifferentiated anvils.
52 = Anvil-abraders.

Kiva B. This habitation structure had a catastrophic ending where all of the household goods were left in place. Unfortunately, these were not mapped by the site's excavator. Many of the in situ abraders were found on the bench: all three soft active abraders, one passive lapidary abrader, and five of the six polishers. Other materials from the bench include bone tools, some in various stages of manufacture, turquoise fragments, and worked sherds. One of the soft abraders (Figure 5.13a) had small holes that could have resulted from drilling—possibly the result of perforating ornaments. The soft sandstone tools could have been used in ornament manufacture; alternatively or additionally, these could have been used in awl manufacture.

Other Observations. Areas I and III represent ramada work areas with large numbers of ground stone artifacts. None of the abraders represent activity areas, but only five of the nine were plotted.

29SJ 1360 probably has a sampling problem. Many classes of materials (such as bone) are represented only by large objects, suggesting a combination of not screening and possibly of retaining only the nicest objects.

In reviewing the abrader assemblage as a whole, the site has some differences. The percentage of active abraders is fairly high, 31.5 percent, as is typical for both Pueblo II and Pueblo III sites. It has a high ratio of soft to hard active abraders. It also has the highest percentage (4.5 percent) of faceted abraders found at any site. This may suggest a special kind of activity. Unfortunately, all were found in fill proveniences. Possibly related to this is the 3.4 percent of edge abraders, two or three times the percentage found at any other site. Abrader-anvils are not as common as at other sites with similar dates, but this could be sampling error. Passive abraders are low in frequency, only 2.2 percent, comparable only to 29SJ 633 and the Basketmaker sites. No palettes were found; this is atypical of sites in this period. There are more polishers of all kinds than there should be at this late date. Two factors may account for this. McKenna (personal communication 1979, 1984) thought that they were making pottery at the site, and many of these polishers may fall toward the early end of the occupation. Anvil frequencies are about as expected.

In material selection, 29SJ 1360 ranks second only to 29SJ 423 in the amount of soft sandstone used (22.5 percent and 23.1 percent respectively); 9 percent to 13 percent is more normal for sites in this period. This does suggest that if something special was processed at the site, it was wood or another soft material such as bone. The soft to hard ratio is consistent throughout the site and not restricted to certain proveniences. It is also possible that these were selected by the excavators as many were a nice, bright white sandstone. Cobbles of four kinds of material were found, metamorphic, igneous, quartzite, and quartz.

The low percentage of "other-shaped" abraders (22.1 percent) may also be due to selection by the excavators; most sites with a good sample size and in the same time range are higher. A very low percentage of the abraders were lightly used, only 19.1 percent, more like the earlier sites than the later ones.

Shabik'eshchee Village (29SJ 1659)

Shabik'eshchee Village is located on the south side of Chaco Canyon on the lowest bench of Chacra Mesa. Frank H. H. Roberts of the National Geographic Society's Pueblo Bonito Expedition excavated numerous pithouses, cists, and a great kiva at the site (Roberts 1929). In 1973, one pithouse was tested and another was excavated under the direction of Alden Hayes (1975). The purpose was an attempt to find a clay-lined hearth for archeomagnetic dating.

Nineteen abraders were recovered from the site, mostly from the fill of the pithouse. Of these 59.7 percent were complete. See Table 5.181 for their distribution within the site.

Pithouse Y. This structure was filled with a layer of thin trash and another layer of alluvium. Thirteen abraders were found in the fill, mostly polishers and anvils, but also found were four hard active abraders and one passive lapidary abrader; the latter type is not usually found in earlier sites. An irregular piece of modified turquoise debris was found on the floor of the structure.

Again, the small sample size makes any conclusions tenuous. Although active abraders seem to make up a large part of the assemblage, the percentage is still comparable to other Basketmaker III sites. Polishers and anvils occur in the expected

frequencies. The almost total absence of passive abraders is probably a sampling error. The site conforms to the Basketmaker pattern in almost all other characteristics.

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Appendix 5A

Abrader Random Sample Format

Variable		Column Number(s)
	GENERAL	
001	Condition of Artifact	19
	1 complete	
	2 slight damage	
	3 broken	
	4 broken but still utilized	
	5 fragmentary	
	6 possibly broken but analyzed as complete	
002	Weight to the Nearest Gram	20-25
003	Length to the Nearest Centimeter	26-28
004	Width to the Nearest Centimeter	29-31
005	Thickness to the Nearest Centimeter	32-34
006	Burning	35
	0 none	
	1 partially	
	2 completely	
007	Kind of Material	36-37
	02 soft sandstone	
	03 medium sandstone	
	04 medium-hard sandstone	
	05 hard sandstone	
	see the inventory for other material types	
008	Color of Material	
	see Munsell color chart	
009	Grain Size	41
	1 very fine (0.125 -0.0625 mm)	
	2 fine (0.25 - 0.125 mm)	
	3 medium (0.50 - 0.25 mm)	
	4 coarse (1.0 - 0.5 mm)	
010	Grain Shape	42
	1 angular	
	2 sub-angular	
	3 sub-round	
	4 round	
011	Grain Sorting	43
	1 homogeneous	
	2 heterogeneous	
012	Plan View	44
	1 square	
	2 rectangular	
	3 oblong	
	4 round	
	5 D-shaped	

	6 triangular or trapizoidal	
	8 irregular	
	9 unknown	
013	Previous Form	45
	0 natural	
	1 concretion	
	2 river cobble	
	3 mano	
	4 metate	
	5 abrader	
	6 slab cover	
	9 unknown	
	ANALYSIS OF THE PRIMARY FUNCTION	
014	Artifact Type	46
	1 active abrader	
	2 passive abrader	
	3 grooved abrader	
	4 polishing stone	
	5 anvil	
	6 palette	
	7 mortar	
015	Degree of Primary Wear	47
	1 light	
	2 medium	
	3 heavy	
	4 mixed	
	9 undeterminable	
016	Manufacture Associated with the Primary Use	48
	1 unmodified	
	2 flaked	
	3 pecked	
	4 flaked and abraded	
	5 abraded and pecked	
	6 flaked and pecked	
	7 flaked, pecked and abraded	
	9 unknown	
017	Amount of Work Invested in the Artifact	49
	1 none - unmodified	
	2 slight	
	3 average	
	4 extensive	
	5 superior	
	9 unknown	
	ANALYSIS OF THE PRIMARY USE SURFACE	
	USE SURFACE 1	
018	Transverse Outline	50
	1 flat	
	2 flat with a slight taper at the edges	
	3 slightly concave	

	4 concave	
	5 very concave	
	6 slightly convex	
	7 convex	
	8 other	
019	Horizontal Outline	51
	same as variable 018	
020	Shape of Use Surface 1	52
	1 rectangular	
	2 triangular	
	3 round	
	4 oblong	
	5 square	
	6 D-shaped	
	8 irregular	
	9 unknown	
021	Area of Use Surface 1 in Square Centimeters	53-56
022	Other Wear Associated with Use Surface 1 (choose 2)	57-58
	1 edge-rounding	
	2 cutting or gouging	
	3 grinding/polish	
	4 parallel striations	
	5 irregular striations	
	6 ridging or grooving	
	7 drill holes	
	8 pecks or pits	
	9 staining	
023	Degree of This Other Wear	59
	1 light	
	2 medium	
	3 heavy	
	4 light/heavy	
	5 heavy/light	
	6 light/medium	
	7 medium/light	
	8 heavy/medium	
	9 undeterminable	
024	The Number of Other Use Surfaces Very Similar to This	60-61
025	Location of These Surfaces in Relation to Surface 1	62
	1 opposite	
	2 adjacent—non-right angle	
	3 adjacent—right angle	
	4 corner—adjacent	
	5 same plane—parallel	
	6 same plane—overlapping	
	7 same plane—random	
	8 angled	
	9 mixed	

	USE SURFACE TWO		
026	Transverse Outline same as Variable 018		63
027	Horizontal Outline same as Variable 018		64
028	Shape of Use Surface Two same as Variable 020		65
029	Area of Surface Two in Square Centimeters	Card 2	8-11
030	Location of Use Surface 2 in Relation to Surface 1 same as Variable 025		12
031	Other Wear Associated with Use Surface Two (choose 2) same as Variable 022		13-14
032	Degree of This Other Wear same as Variable 023		15
033	Number of Other Use Surfaces Similar to This		16
034	Location of These Surfaces in Relation to Surface 2 same as Variable 025		17
035	Number of Unanalyzed Use Surfaces Not Like Either 1 or 2 But Having the Same Primary Function		
	ANALYSIS OF THE SECONDARY USE		
036	Artifact Type see the inventory list		19-20
037	Manufacture Associated with the Secondary Use same as Variable 016		21
038	Location of This Use to the Primary Function Use Surface 1 same as Variable 025		22
039	Shape of the Secondary Use Area same as Variable 020		
040	Area of the Secondary Use Area in Square Centimeters		24-27
041	Other Wear Associated with the Secondary Use Surfaces same as Variable 022 (Choose 2)		28-29
042	Degree of Other Wear same as Variable 023		30
043	Number of Other Use Surfaces Very Similar to This		31
	OTHER USE TYPE		
044	Type of Use 1 grinding 2 pounding 3 cutting or gouging 4 staining		32
045	Degree of Such Use 1 light 2 medium 3 heavy 4 mixed 9 undeterminable		33
046	Field Specimen Number	both cards	73-77

Appendix 5B

Abrader Analysis Format

Variable		Column Number(s)
001-008	Provenience Coding (same as inventory)	1-18
009	Condition of Artifact	19
	1 complete (includes slight damage)	
	2 broken	
	3 fragmentary	
010	Weight in Grams	20-24
011	Length to the Nearest Centimeter	25-27
012	Width to the Nearest Centimeter	28-30
013	Thickness to the Nearest Centimeter	31-32
014	Burning	33
	1 none	
	2 partially	
	3 completely	
015	Material Type	34-35
	01 soft sandstone	
	02 medium sandstone	
	03 medium-hard sandstone	
	04 hard sandstone	
	see inventory list for other material type codes	
016	Color of Material	36-38
	Munsell Rock Color Chart	
017	Grain Size (sandstone only)	39
	1 very fine	
	2 fine	
	3 medium	
018	Plan View	40
	1 rectilinear	
	2 circular	
	3 other	
	9 unknown	
019	Previous Form	41
	0 natural	
	1 concretion	
	2 river cobble	
	3 mano	
	4 metate	
	5 abrader	
	6 slab cover	
	7 anvil	
	8 other	
	9 unknown	
020	Primary Artifact Type	42-43
	10 active abrader	

11 faceted active abrader
12 active lapidary abrader
13 manolike abrader
14 stone abraded for pigment
15 paint grinder
16 edge abrader
17 pestle-cornbreaker
18 strange abraded rock
19 abrader and anvil on one face
20 undifferentiated passive abrader
21 passive abrader-anvil
22 passive lapidary abrader
23 whetstone
24 mortar (non-paint)
25 hole pecked in a stone
26 undifferentiated palette
27 raised bordered palette
28 incidental palette
29 mortar-palette
30 undifferentiated grooved abrader
31 shaft shaper
32 decorative grooved rock
33 sharpener
40 undifferentiated polishing stone
41 pot polisher
42 floor polisher
43 broken edge abraded polisher
44 lightning stone
50 undifferentiated anvil
51 anvil-passive abrader
52 anvil-abrader (on opposite faces)

021 Manufacture 44

0 unmodified
1 flaked
2 abraded
3 pecked
4 flaked and abraded
5 pecked and flaked
6 pecked and abraded
7 flaked, pecked, abraded

022 Amount of Work Invested in the Artifact 45

1 none—unmodified
2 slight
3 moderate
4 extensive
9 unknown

023 Degree of Primary Wear 46

1 light
2 moderate
3 heavy
4 mixed

	9 unknown	
024	Area of the Primary Use Surface in Square Centimeters	47-50
025	Transverse Surface Contour	
	record and number of surfaces with each	
	irregular	51
	flat, flat with slight taper at edges	52
	slightly concave	53
	concave	54
	slightly convex	55
	convex	56
026	Location of Surfaces	
	record the number of surfaces in each	
	opposite or angled	57
	adjacent—non-right angle	58
	adjacent—right angle	59
	same plane—parallel	60
	same plane—random	61
	Other Use on the Primary Surface(s)	
	0 absent	
	1 light	
	2 medium	
	3 heavy	
	4 characteristic of the artifact assignment	
	5 characteristic of a previous use	
	6 characteristic of a secondary use	
027	Edge-rounding	62
028	Cutting/gouging	63
029	Grinding/polish	64
030	Striations	65
031	Pecks	66
032	Staining	67
033	Other	68
034	Secondary Artifact Type	69-70
	see the inventory list for codes	
035	Amount of Secondary Wear	71
	1 light	
	2 moderate	
	3 heavy	
036	Location of the Secondary Wear	72
	1 opposite or angled	
	2 adjacent—non-right angle	
	3 adjacent—right angle	
	4 corner	
	5 same plane	
	6 the whole artifact	
	7 ends and edges	
	8 other	
037	Field Specimen (FS) Number	73-77
038	A, B, C, etc.	78
039	Specimen Number	79-80

Appendix 5C

Material Types from the Inventory

30	iron concretion
31	siltstone/shale/slate
35	limestone
36	metamorphic rocks
37	basalt
38	obsidian
39	granite
40	igneous rocks
41	chalcedony
42	moss agate
43	banded chalcedony
44	banded chert
45	chert
46	jasper
47	quartzite
48	quartz
49	other stone

Artifact Types from the Inventory

01	mano
02	metate
03	pestle/initial cornbreaker
04	mortar
05	active abrader
06	passive abrader
07	palette
08	grooved abrader
09	anvil
10	polishing stone
11	lapstone/last
12	axe
21	hoe
22	maul
23	hammerstone
24	chopper
25	slab cover
31	pot lid
32	griddle
33	pot rest
34	post shim
35	manolike slab
36	architectural slab
39	other-shaped stone

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